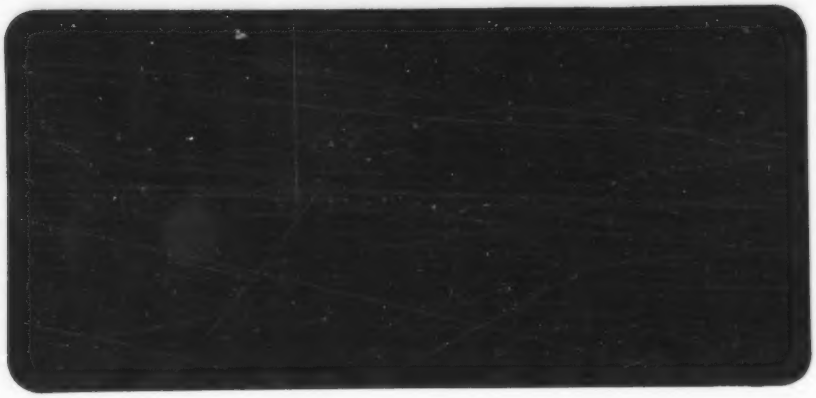
Working Paper

Document de travail



Fiscal Policy and
Economic Analysis
Branch

Department of Finance

Direction de la
politique fiscale
et de l'analyse économique

Ministère des Finances

101-06218/

The Contribution of Fiscal Policy to Real Interest Rate Movements in the 1980s

by

Paul Jenkins

Working Paper No. 90-5

Economic Studies and Policy Analysis Division
Fiscal Policy and Economic Analysis Branch
Department of Finance, Canada

The author wishes to thank Paul-Henri Lapointe, Munir Sheikh, David Moloney, Mary MacGregor, and Benoit Robidoux for helpful comments on earlier versions of this paper. All errors remain the responsibility of the author.

Working Papers are intended to make analytic work undertaken in the Department of Finance available to a wider readership. They have received only limited evaluation and do not necessarily represent the views of the Department of Finance. Comments on the working papers are invited and may be sent to the author(s). They are circulated in the language of preparation.

Abstract

Since the early 1980s, high world real interest rates have been a feature common to the economies of most industrial countries. This paper reviews various theoretical perspectives regarding the link between fiscal policy and real interest rates, and discusses the results of simulations using INTERMOD, the Department of Finance's multi-country econometric model, that illustrate the impact of changes in fiscal policy on real interest rate movements during the 1980s.

Comparison of real interest rates with changes in government expenditure, budget deficits, and public debt among the industrialized countries shows that the high real interest rates of the 1980s have been accompanied by a substantial increase in fiscal stimulus. A positive relationship between government expenditure and real interest rates is also consistent with received macroeconomic theory. Considerable controversy exists, however, regarding whether changes in the stock of public debt have additional effects on real interest rates. Keynesian theory, for example, posits that the rise in public debt resulting from deficit-financed changes in government expenditure has a further positive effect on real interest rates, through its impact on household wealth. However, recent theoretical developments have shown that this effect could be partially offset if agents are forward looking, and thus take account of the higher taxes that might be levied during their lifetimes or upon their decendants in order to service the increased public debt.

Simulations using INTERMOD indicate that changes in fiscal policy among the industrial countries in the 1970s can account for between 2.2 and 2.8 percentage points of the 5 percentage point rise in real interest rates over this period. The greatest effect on real interest rates can be traced to the rise in government budget deficits in the 1980s, with the increase in government expenditure having a substantial additional effect.

Résumé

Depuis le début des années 80, les taux d'intérêt réels ont été élevés dans la plupart des pays industrialisés. Ce document examine diverses perspectives théoriques concernant le lien qui existe entre la politique budgétaire gouvernementale et les taux d'intérêt réels et présente les résultats de simulations effectuées à l'aide du modèle INTERMOD (le modèle économétrique multi-pays du ministère des Finances) qui montrent l'impact des changements apportés à la politique budgétaire gouvernementale sur l'évolution des taux d'intérêt réels au cours des années 80.

Une comparaison des taux d'intérêt réels et de l'évolution des dépenses, des déficits budgétaires et de la dette des gouvernements des pays industrialisés montre que les taux d'intérêt réels élevés enregistrés au cours des années 80 ont été accompagnés d'une augmentation importante des stimulants fiscaux. Un rapport positif entre les dépenses publiques et les taux d'intérêt réels est également compatible avec la plupart des théories macroéconomiques. Cependant, il existe une grande controverse lorsqu'il s'agit de déterminer si l'évolution de la dette publique a un effet supplémentaire sur les taux d'intérêt réels. Selon la théorie keynésienne l'augmentation de la dette publique, résultant de l'augmentation des dépenses publiques financée par emprunts, a un effet positif supplémentaire sur les taux d'intérêt réels, à cause de son impact sur la richesse des ménages. Cependant, selon des travaux théoriques récents, cet effet pourrait être en partie éliminé si les agents avaient des anticipations prospectives et qu'ils tenaient en conséquence compte des impôts ultérieurs plus élevés qui pourraient être perçus sur leur revenu (ou autrement) ou celui de leurs descandants afin d'assurer le service de la dette publique accrue.

Selon des simulations effectuées à l'aide du modèle INTERMOD, les changements apportés à la politique budgétaire gouvernementale des pays industrialisés au cours des années 70 ont apporté une contribution variant de 2.2 à 2.8 points de pourcentage à l'augmentation de 5 points de pourcentage des taux d'intérêt réels observée sur cette période. L'effet le plus important sur les taux d'intérêt réels peut être attribué à l'augmentation des déficits budgétaires publics dans les années 80, l'augmentation des dépenses publiques ayant également eu, selon les simulations effectuées, un impact important sur les taux d'intérêt réels.

Table of Contents

1. Introduction 1

2. Fiscal Policy and Real Interest Rates: Some Stylized Facts 1

3. Theoretical Perspectives 4
   - 3.1 Fiscal Policy and Real Interest Rates in Keynesian Theory 5
   - 3.2 Consumption Smoothing, Deficits, and Real Interest Rates 6

4. Effects of Fiscal Policy on Real Interest Rates: Simulation Results 8
   - 4.1 Simulation Methodology and Description of the Shocks 8
   - 4.2 Simulation Results Assuming Myopic Agents 10
   - 4.3 Simulation Results with Forward-Looking Agents 12

5. Results from Other Studies 16

6. Conclusions 18

1. Introduction

Since the early 1980s, persistent high real interest rates have been a feature common to the economies of most industrial countries. Unprecedented in the post-war period, they have caused concern because of their potential to inhibit investment and raise the burden of servicing the public debt. It is widely believed that one of the main causes behind these high real interest rates is the rise in government expenditure since the late 1970s, an increase that has translated into large budget deficits for many industrial countries. This paper evaluates the contribution of changes in fiscal policy in the G-7 countries to the increase in real interest rates during the 1980s.

Section 2 outlines the evolution of real interest rates, government expenditure, deficits, and debt since the early 1960s. Section 3 provides theoretical perspectives on the relationship between fiscal policy and real interest rates. Section 4 discusses the results of INTERMOD simulations that illustrate the impact of changes in fiscal policy on real interest rates during the 1980s. Section 5 reviews the results of other studies that use statistical and simulation techniques to quantify the effect of fiscal policy variables on real interest rates. Section 6 concludes the paper.

2. Fiscal Policy and Real Interest Rates: Some Stylized Facts

Before discussing theoretical considerations related to the impact of fiscal policy on real interest rates and estimating the contribution of fiscal policy to real interest rate movements, it is useful to review the main trends in real interest rates, government expenditure and deficits that have prevailed in the industrial countries over the last three decades. Figure 1 shows movements in ex post real interest rates on three month Treasury Bills for each member of the G-7, as well as an estimate of the 'world' real

interest rate based on a weighted average of the real interest rates prevailing in the G-7 countries.[1]

Real interest rates were remarkably stable throughout the G-7 during the 1960s, never deviating by more than 1 percentage point from their average of 1 per cent. This stability was brought to an end by the shocks associated with the collapse of the Bretton Woods system and the 1973 oil-price increase: world real interest rates dropped from 1.5 per cent in 1970 to -4.3 per cent in 1973. In a departure from normal peacetime experience, real rates remained negative for the balance of the decade.

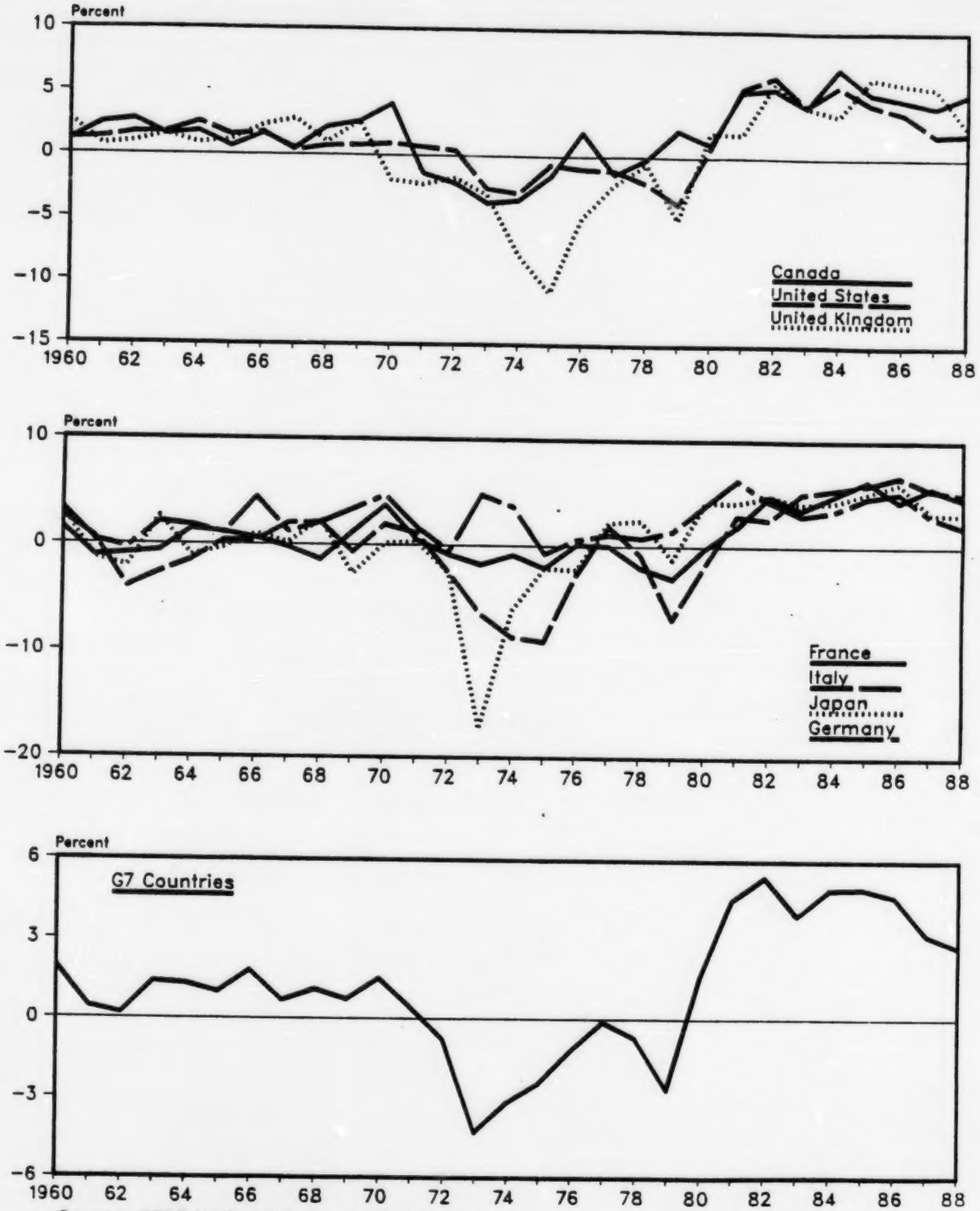
Real interest rates changed again in the 1980s. This time, instead of being sharply lower than in the pre-1970 period, they soared to their highest levels since the 1920s. Real interest rates on three month Treasury Bills exceeded 4 per cent during most of the 1981-85 period and, despite subsequent declines from these peak levels in all G-7 countries, they remain at historically high levels in Canada, France, and Italy.

The impact of government behaviour on real interest rates can be crudely evaluated by comparing the timing of changes in the important fiscal policy variables -- government expenditure and revenue, budget deficits and public debt -- with real interest rate movements. Looking first at the share of general government expenditure on goods and services in GDP (Figure 2), we find little unambiguous evidence linking increases in government consumption to higher real interest rates: throughout the G-7, the steady rise in the share of government expenditure in GDP over the 1960-88 period has not been systematically associated with increases in real interest rates. Indeed, the 1960s, characterized by moderate and stable real interest rates, saw the largest sustained increase in the share of government expenditure in GDP of any of the three decades under study. General government expenditure in the G-7 countries rose by an average of 1.5 per cent of GDP during the 1960s, from 14.1 per cent of GDP in 1960 to 15.6 per cent in 1970. Conversely, the negative real interest rates of the 1970s were associated, not with reductions in the share of government expenditure in output, but with a continued rise in

---

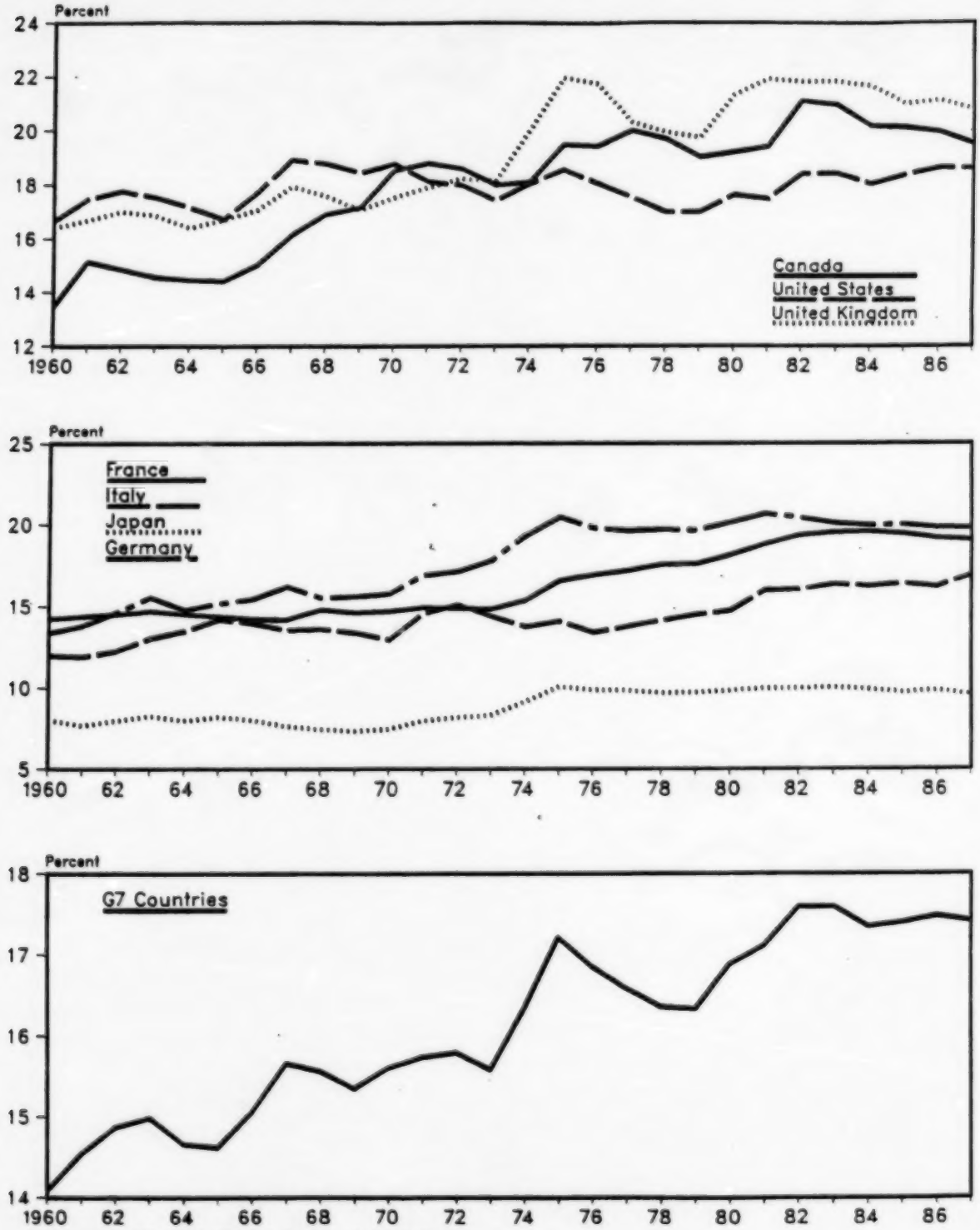
1.Data are obtained from IFSBASE, maintained by the International Monetary Fund. A full description of these data is contained in International Monetary Fund, International Financial Statistics, various issues. The world real interest rate is equal to a weighted average of the real interest rates prevailing in each G-7 country; the weights correspond to each country's 1980 share of total G-7 GDP. Conversions into common currency units are based on 1980 exchange rates. Longer historical series on real interest rates are available in Paul Jenkins, 'Real Interest Rates in Historical Perspective', Department of Finance Working Paper No. 90-6, (Ottawa: Department of Finance, 1991).

Figure 1
Ex Post Real Interest Rates on Short-Term Government Securities
G-7 Countries, 1960-88



Source: OECD National Accounts Database.

Figure 2
General Government Expenditure on Goods and Services as Share of GDP, G-7 Countries



Source: OECD National Accounts Database.

the government expenditure-GDP ratio. Sluggish economic growth, combined with significant increases in government expenditure, caused the ratio of government expenditure to GDP among the G-7 countries to rise to an average of 16.9 per cent by 1980.

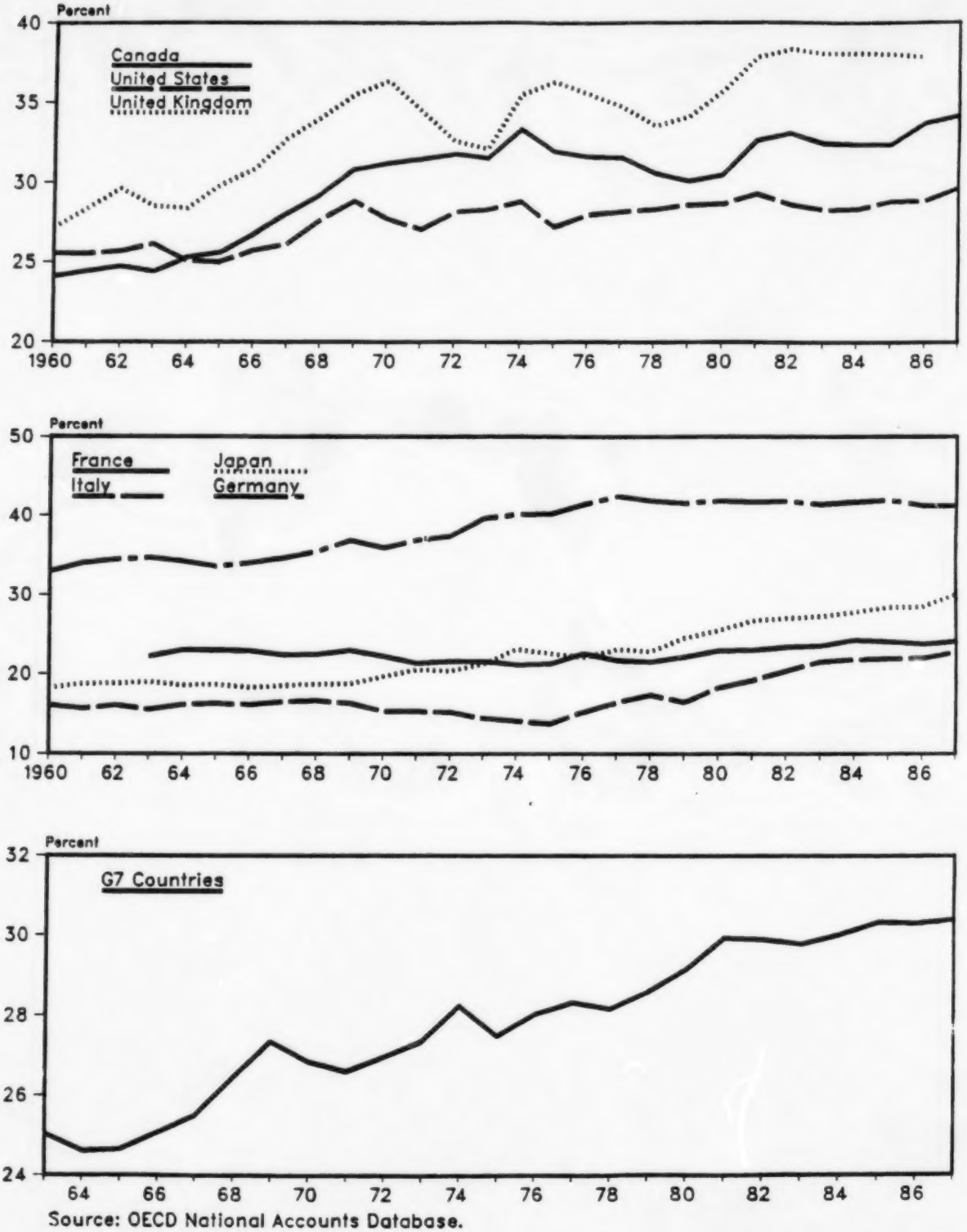
It is only in the 1980s that casual observation of the data hints at a weak positive relationship between government consumption and real interest rates. Between 1979 and 1983, while the ratio of government expenditure to GDP in the G-7 rose from 16.2 per cent to 17.4 per cent, real interest rates on short-term low-risk securities soared from -2.7 per cent to a post-war high of 5.4 per cent. The stabilization of the government expenditure-GDP ratio over the 1984-87 period has been associated with a decline in real interest rates in most G.7 countries. Although numerous other factors, such as the tightening of monetary policy during the early 1980s and its subsequent relaxation in most of the G-7, undoubtedly contributed to movements in real interest rates through the 1980-87 period, marked changes in government consumption in the 1980s did coincide with the most dramatic real interest rate movements in several decades.

The association between expansionary fiscal policy and high real interest rates in the 1980s becomes more evident when changes in taxes, as well as changes in government expenditure, are considered in the measure of the fiscal stance. In most G-7 countries, the expansion in general government consumption over the 1960-80 period was accompanied by large increases in tax revenues. The share of taxes in GDP rose by an average of 4.1 percentage points in the G-7 countries between 1960 and 1980, an increase that actually outpaced the growth in government consumption (Figure 3)[2]. The tendency for increases in government expenditure to be matched by higher taxes has been less pronounced in the 1980s, however. Although the ratio of tax revenues to GDP increased sharply in 1981, the 1982 recession saw a decline in the share of taxes in GDP. Continued slow growth in tax revenues during the early 1980s, combined with increases in the share of government expenditure in GDP, resulted in rising deficits for nearly every G-7 county. Whereas the ratio of the general government deficit to GDP averaged only 1.9 per cent among the G-7 countries during the 1970s, it increased to 4.7 per cent by 1983, and remained above 3.5 per cent through 1986 (Figure 4). Government budget deficits

---

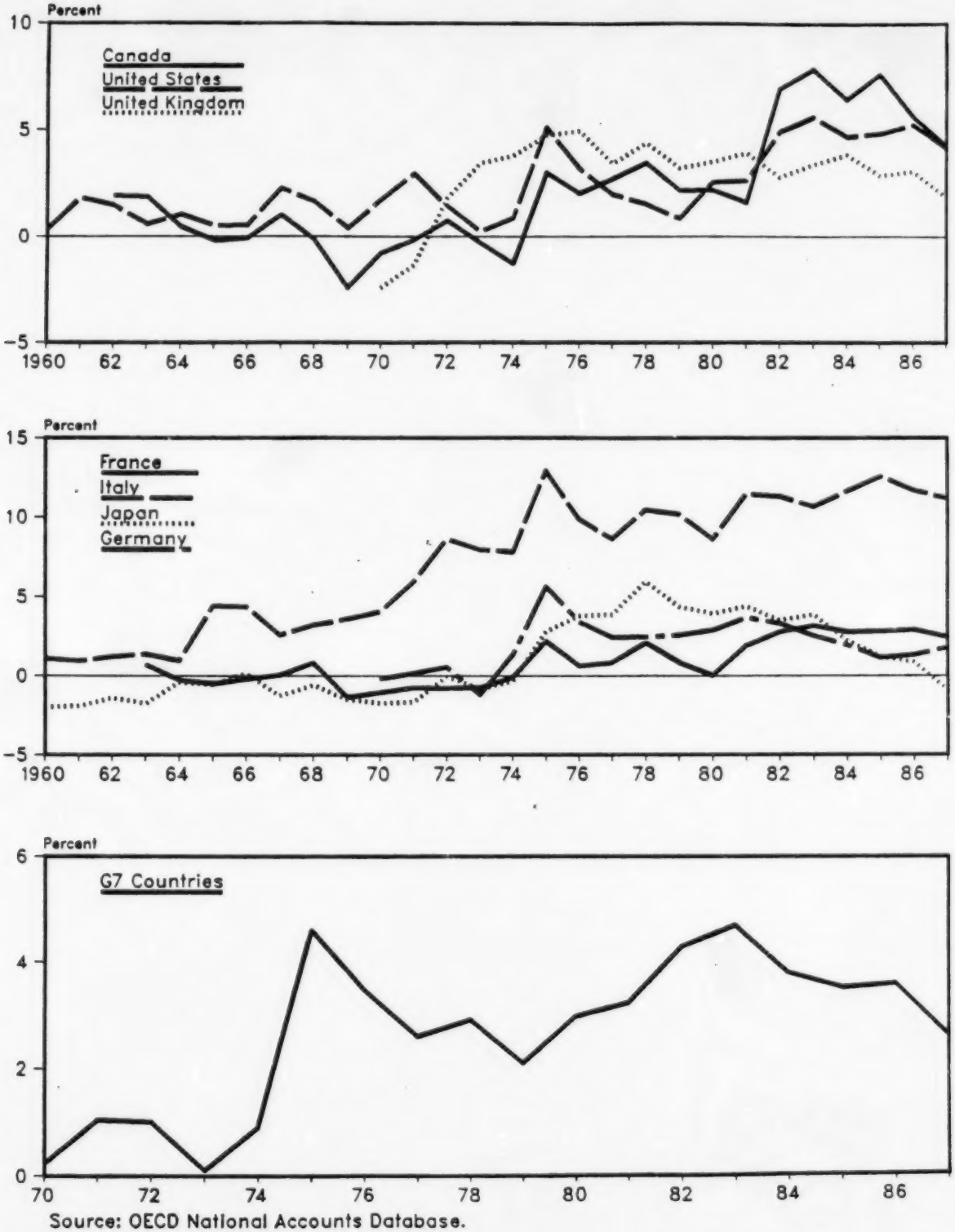
2.Consistent data on the share of general government tax revenue as a share of GDP are unavailable for France before 1963, and for the United Kingdom in 1987. The average for the G-7 countries is therefore given only from 1963; the United Kingdom is omitted from the calculations for 1987

Figure 3
General Government Tax Revenue as
as Share of GDP, G-7 Countries



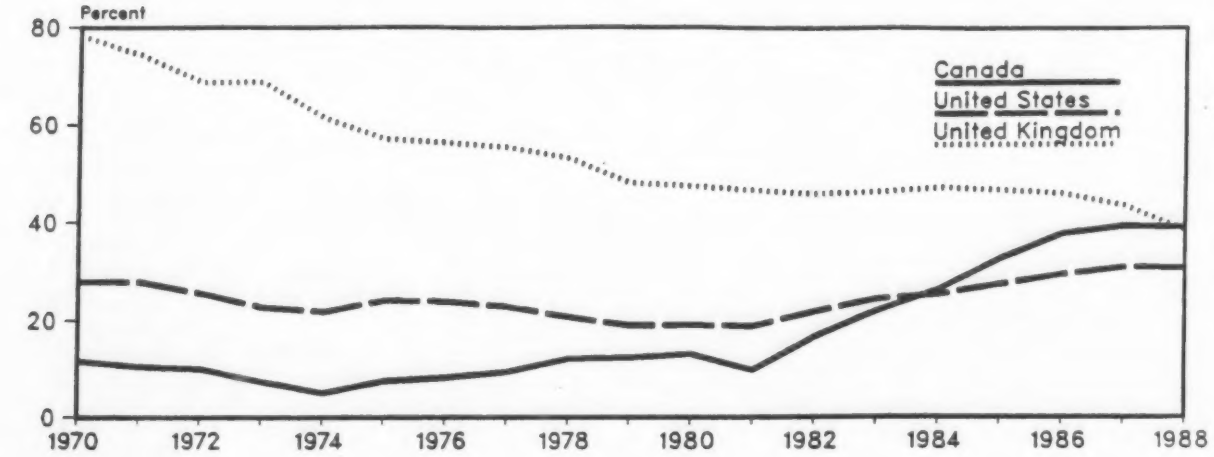
Source: OECD National Accounts Database.

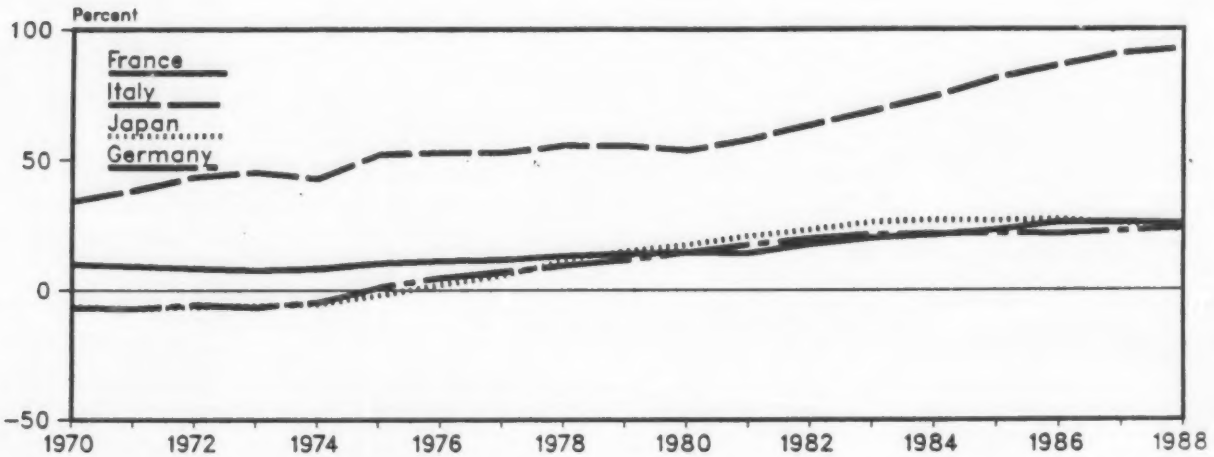
Figure 4
General Government Budget Deficits as
as Share of GDP, G-7 Countries

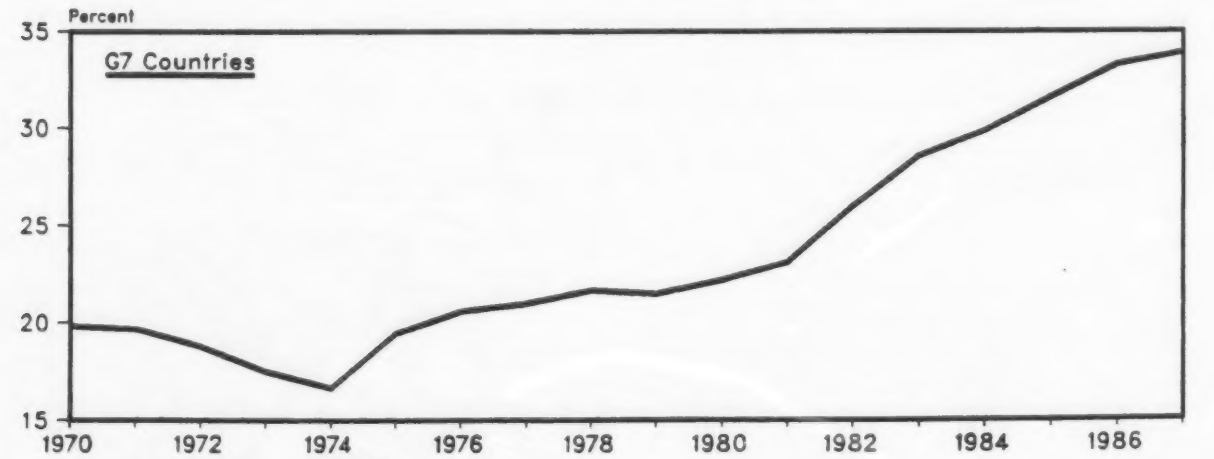


Source: OECD National Accounts Database.

Figure 5
General Government Debt as a Share of GDP, G-7 Countries







Source: Unpublished OECD data.

declined to 2.6 per cent of GDP by 1987, but remained significantly higher than those of the early 1970s.

As shown in Figure 5, the sustained rise in government budget deficits led to a steady increase over the 1980-87 period in the ratio of public debt to GDP for most G-7 countries[3]. At the beginning of the 1970s, the combined debt of all levels of government averaged nearly 20 per cent of GDP in the G-7. High inflation, combined with small budget deficits, led to an erosion of the debt-GDP ratio in the early 1970s; by 1974 it stood at only 16.7 per cent. Slower economic growth over the 1975-79 period, however, resulted in the average debt-GDP ratio for the G-7 rising to 21.5 per cent by 1979. The large budget deficits that accompanied the recession of the early 1980s led to a rapid rise in the public debt: the average debt-GDP ratio for the G-7 countries rose from 22.2 per cent in 1980 to 29.8 per cent by 1984. Despite a decline in the ratio for the United Kingdom, the persistence of large budget deficits in most of the other G-7 countries has contributed to further increases: by 1987 the average debt-GDP ratio stood at 33.9 per cent.

3. Theoretical Perspectives

In the preceding section, it was shown that the rise in world real interest rates during the 1980s was associated with rising government expenditure, increasing deficits, and the accumulation of large stocks of public debt. This section reviews alternative hypotheses on the link between these fiscal policy variables and real interest rates. Section 3.1 describes the Keynesian perspective on the relationship between fiscal policy and real interest rates. Section 3.2 discusses the insights of modified models that assume that agents take account of the existence of government deficits and debt in determining their optimal consumption and savings decisions. Since this paper focuses on the effects of worldwide changes in fiscal policy on world interest rates, the discussion of various models will be confined to elements relevant to closed economies.

3.Figure 5 contains unpublished OECD data. Internationally consistent data for the stock of general government debt are unavailable for Canada before 1962, for France before 1963, and for the United Kingdom before 1970. The average for the G-7 countries is thus given only for 1970-87.

3.1 Fiscal Policy and Real Interest Rates in Keynesian Theory

The popular view that today's high world real interest rates are related to increases in government expenditure, and especially to large budget deficits, can be traced to Keynesian analysis. In the simplest fixed-price Keynesian models, which permit resources to be unemployed for prolonged periods, tax-financed increases in government expenditure within a closed economy contribute to an initial increase in goods production. This is the case because the expansionary effect of higher government expenditure overcomes the contractionary effect of the tax increase, which would otherwise lower consumption (and hence aggregate demand) by reducing disposable income. The incipient increase in income resulting from the higher level of output leads to higher money demand; with a fixed money supply, interest rates will rise to restore money market equilibrium.[4]

Deficit-financed increases in government expenditure, on the other hand, have the potential for a much larger impact on output and interest rates in this framework than increases in government expenditure financed by higher taxes. Deficit-financed increases in government expenditure have no adverse effects on disposable income, leaving consumption initially unchanged. The total stimulus to goods production is initially larger, leading to a higher equilibrium interest rate.

The effect on interest rates of deficit-financed increases in government spending may be greater still in versions of the Keynesian model where individuals' consumption and demand for money are positively related to their current financial wealth, which includes government bonds. In this case, the initial income expansion due to increased government expenditure is supplemented by higher consumption stemming from the perceived increase in wealth. The larger rise in income, combined with the direct effect on money demand of larger holdings of government bonds, can lead to a greater increase in interest rates than in the basic Keynesian model where these wealth effects are absent.

---

4. This analysis ignores the possibility of a 'liquidity trap' in which agents would hold any quantity of money balances at a given interest rate. In this case, increases in income such as those resulting from expansionary fiscal policy do not lead to higher interest rates and do not crowd out investment.

3.2 Consumption Smoothing, Deficits, and Real Interest Rates

The Keynesian approach to analyzing the impact of fiscal policy on real interest rates assumes that consumption is mainly determined by current variables such as disposable income and financial wealth. An assumption more consistent with economic rationality, however, is that people choose the level of consumption expenditure in a particular period in the same way that they are assumed to determine the composition of consumption within the period: by maximizing utility subject to budget constraints. The life-cycle hypothesis embraces this approach by assuming that agents determine their consumption in each period by maximizing lifetime utility subject to the constraint that the present value of lifetime consumption not exceed initial period financial wealth plus human wealth -- the present value of future disposable labour income.[5] The optimal level of consumption in any period is thus related, not merely to current disposable income and financial wealth as in Keynesian models, but also to the present value of future disposable income. One important prediction of this model is that agents will tend to smooth consumption intertemporally when faced with temporary changes in disposable income.

The hypothesis that consumption is related to future, as well as current, resources also has important implications for the impact of government expenditure and deficits on real interest rates. While consumption responds passively in the Keynesian model to changes in current disposable income and financial wealth resulting from shifts in fiscal policy, the life-cycle hypothesis suggests that the relationship between these variables and consumption may change as a result of government action. In particular, it is affected by the perceived permanence of the policy change. A temporary tax-financed change in government expenditure, for example, will reduce the current consumption of those who behave according to the life-cycle hypothesis by less than the reduction predicted by the Keynesian model: the effect on consumption of lower current disposable income will be distributed over their entire remaining lifetimes instead of falling entirely in the current period. The initial effect on real interest rates of such an increase in government expenditure will thus be larger if individuals behave according to the life-cycle hypothesis than if they are Keynesian consumers. Since the decline in consumption will be spread

---

5.Franco Modigliani and Richard Brumberg, 'Utility Analysis and the Consumption Function', in Kenneth Kurihara ed. Post Keynesian Economics, (New Brunswick, New Jersey: Rutgers University Press, 1954).

over agents' entire lifetimes, however, real interest rates may be marginally lower in the long run than if the rise in government expenditure had not taken place.

The effects of a permanent balance-budget increase in government expenditure, in contrast, are broadly similar in the Keynesian and life-cycle models, as both predict that such a rise in government expenditure reduces both current and future disposable income, lowering consumption. The rise in interest rates in a life-cycle model may be somewhat smaller than that predicted by naive Keynesian models, however, as forward-looking agents would likely perceive that, to the extent that output is fixed at its potential level in the long-run, increases in government expenditure have no persistent expansionary effect: permanently higher government expenditure merely crowds out consumption by reducing lifetime disposable income.

The effects on interest rates of deficit-financed increases in government expenditure are also modified if one assumes that current consumption responds to changes in both current and future disposable income and financial wealth. In the Keynesian model, consumption either does not respond directly to deficit-financed changes in government expenditure or actually increases due to the rise in agents' financial wealth resulting from their purchases of government bonds. The life-cycle hypothesis, with its focus on the role of lifetime resources in determining consumption, predicts that while agents perceive government bonds as part of their wealth, they also take account of the taxes that might be levied during their lifetimes to service and ultimately reduce the public debt.

According to the life-cycle hypothesis, a key issue in assessing the effect of deficit-financed fiscal expansion on consumption is whether agents perceive that increases in public debt will be offset by higher taxes over their remaining lifetimes. If the higher public debt resulting from deficits is likely to be fully repaid during the lifetimes of people now alive, then the rise in financial wealth associated with increased government bond holdings will not stimulate consumption (assuming no liquidity constraints), since it will be entirely offset by a reduction in human wealth equal to the present value of future taxes required to repay the public debt. The interest-rate effects of a deficit-financed increase in government expenditure will be similar in this case to those of a tax-financed expenditure increase.

On the other hand, to the extent taxes that the needed to repay the public debt are levied on future generations, individuals now alive will regard at least part of their holdings

of government bonds as net wealth and may thus increase their current consumption. The increase in interest rates resulting from a deficit-financed government expenditure increase will then be more than when the additional expenditure is financed by taxes. Yet according to Barro (1974), even finite-lived agents could effectively have infinite horizons due to the existence of intergenerational linkages. An increase in the government deficit could thus only raise interest rates by the same amount as would an equally large expenditure increase financed by higher taxes.[6] In Barro's formulation, agents consume, save, and leave bequests in order to maximize a utility function that contains not only the instantaneous utility in each remaining period of their own lives, but also the lifetime utility of their descendants. Government deficits that impose a higher tax burden on future generations cause these altruistic agents to preserve the utility of their offspring by increasing bequests; the associated decline in current consumption entirely offsets the effect of the higher deficit on interest rates.

4. Effects of Fiscal Policy on Real Interest Rates: Simulation Results

In the preceding section, the view that increases in government expenditure, especially those that are deficit financed, lead to higher real interest rates was supported by two well-known theories of consumption. The additional effect of higher public debt is more uncertain, however, as it depends on the reaction of agents to changes in future taxes. The purpose of this section is to estimate the separate contributions of increases in government expenditure, deficits, and debt over the 1970-88 period to movements in real interest rates using INTERMOD simulations. We also assess the sensitivity of these results to alternative assumptions about agents's planning horizons and the perceived permanence of the shock.

4.1 Simulation Methodology and Description of the Shocks

We decompose the total impact of fiscal policy changes over the 1980-88 period into the separate effects associated with increased government expenditure, higher deficits,

---

6.Robert J. Barro, 'Are Government Bonds Net Wealth?' The Journal of Political Economy, Vol. 82, no 6 (1974), pp. 1095-1117.

and rising stocks of public debt. To do so, we have performed INTERMOD simulations in three steps. As a first step, government expenditure on goods and services (i.e., excluding interest payments on the public debt) during 1980-89 is reduced in each G-7 country by the amount by which its average value in that county during the 1980s exceeded that of the 1970s; the shock applied to a G-7 country is thus intended to reproduce its particular fiscal policy experience over the last two decades. The government deficit and the stock of public debt are held at the 1980s level, leaving the tax rate to adjust endogenously to the reduction in spending. The difference between the real interest rate obtained in the simulation and that actually observed over the 1980-89 period shows the direct contribution of increases in the ratio of government expenditure to GDP since the late 1970s to increases in real interest rates.

The additional effect of increased government budget deficits on interest rates is investigated in the second step of the simulation. Both the ratio of the general government budget deficit to GDP and the share of government expenditure in GDP are lowered to the average of the 1970-79 period, with the stock of public debt remaining at its historical 1980-89 level. The tax rate adjusts endogenously to satisfy the government budget constraint, given the lower levels of government expenditure and the deficit.

The final step, in which all three fiscal variables are returned to the average level of the 1970s, illustrates the total effect of fiscal policy on real interest rates. As in the other two steps, the tax rate remains endogenous, changing in accordance with movements in economic activity to satisfy the government's budget constraint. The use of this stepwise procedure allows the separate effects of each fiscal policy component to be easily isolated, since the difference between the first and second steps of the simulation shows the effect of the rise in budget deficits on real interest rates, while the difference between the second and third steps shows the effect of the rise in the stock of public debt in the 1980s. In order to separate the contribution of fiscal policy to real interest rate movements from the effects of changes in monetary policy, the nominal money supply is held at its historical level in all simulations.

Table 1 summarizes the shocks to government expenditure, deficits, and public debt applied in the INTERMOD simulations. The government spending shock involves a large reduction in the share of general government expenditure on goods and services (excluding public debt service) in GDP for every industrial country. The largest government spending

TABLE 1

Description of Shocks to Government Expenditure, Budget Deficits, and Public Debt Used for INTERMOD Simulations
(per cent of GDP)

Country	Government Expenditure			Budget Deficits			Public Debt		
	1970-79	1980-87	Shock	1970-79	1980-87	Shock	1970-79	1980-87	Shock
Canada	19.0	20.0	-1.0	1.2	5.3	-4.1	9.4	24.6	-15.2
United States	17.9	18.2	-0.3	2.0	4.3	-2.3	23.6	24.5	-0.9
Japan	9.0	9.8	-0.8	1.6	2.4	-0.8	0	24.2	-24.2
Germany	18.6	20.1	-1.5	1.7	2.3	-0.6	0.1	20.1	-20.0
United Kingdom	19.6	21.4	-1.8	2.6	2.9	-.3	62.1	46.1	16.0
France	16.1	19.1	-3.0	1.2	2.3	-1.1	10.3	20.3	-10.0
Italy	14.0	16.1	-2.1	8.6	11.1	-2.5	47.2	72.0	-24.8
Average	16.2	17.4	-1.2	1.9	3.6	-1.7	23.7	34.4	-10.7

shock, in which government expenditure is reduced by 3.0 per cent of GDP, is applied to France, but in four other members of the G-7 -- Canada, Germany, the United Kingdom, and Italy -- the shook equals or exceeds 1 per cent of GDP. Government spending is reduced by 0.8 per cent of GDP in Japan and a negligible 0.3 per cent of GDP in the United States. The weighted-average shock to government expenditure is equal to 1.2 per cent of GDP across the G-7 countries.

As with the government spending shocks, the countries with the largest shocks to general government budget deficits include Canada, France, and Italy. For Canada and Italy, the shook to the budget deficit was even larger than that to government expenditure, suggesting that for these countries movements in tax rates should play a significant role in the simulations in augmenting the effects of shifts in government spending. The effects of tax changes are especially important for the United States because, although the shock to U.S. government expenditure is the smallest of any industrial country, the shock applied to its budget deficit is the third highest. The shocks to the deficits of Germany, the United Kingdom, and France are, however, much smaller than their government spending shocks, suggesting that the impact on real interest rates of changes in government expenditure in the simulations may be somewhat offset by the response of taxes. Changes in tax rates are likely to have little impact in the simulations for Japan, since the shock to its deficit is the same size as the shock to government expenditure. Overall, the shock to general government budget deficits averages 1.7 per cent of GDP in the industrial countries.

For all countries except the United Kingdom and the United States, the shocks to net government debt consist of large reductions in the ratio of net general government debt to GDP. The shock to U.S. government debt is much smaller than the shocks for most other industrial countries, averaging only 0.9 per cent of GDP, while the debt-GDP ratio is actually raised by 16 per cent for the United Kingdom. For the G-7 as a whole, the debt-GDP ratio is reduced by 10.7 percentage points in the simulations.

4.2 Simulation Results Assuming Myopic Agents

Table 2 summarizes the estimated effects on real interest rates of changes in fiscal policy over the 1980-89 period based on the three alternative INTERMOD simulations; Figures 6 through 9 show the results in detail. While government expenditure was reduced

TABLE 2

Simulated Effect on Real Interest Rates of Increases in Government Expenditure, Budget Deficits, and Public Debt in Industrial Countries

(percentage points)

Country/Fiscal Component	Agents Not Forward Looking	Agents Forward Looking Temporary	Agents Forward Looking Permanent
Canada			
Govt. Exp.	0.7	1.2	0.5
Deficit	2.1	1.8	1.9
Debt	0.2	0.0	-0.2
Total	3.0	3.0	2.2
Observed Increase	5.2	5.2	5.2
United States			
Govt. Exp.	0.7	1.0	0.5
Deficit	2.1	1.7	1.9
Debt	0.0	0.0	-0.1
Total	2.8	2.7	2.3
Observed Increase	5.0	5.0	5.0
Japan			
Govt. Exp.	0.8	1.0	0.4
Deficit	1.6	1.0	1.5
Debt	0.6	-0.1	-0.4
Total	3.0	1.9	1.5
Observed Increase	7.0	7.0	7.0
Germany			
Govt. Exp.	0.8	1.6	0.4
Deficit	1.5	0.9	1.5
Debt	0.3	0.3	0.0
Total	2.6	2.8	1.9
Observed Increase	2.2	2.2	2.2

---

* Simulation Results for 1989

TABLE 2 (cont'd)

Country/Fiscal Component	Agents Not Forward Looking	Agents Forward Looking Temporary	Agents Forward Looking Permanent
United Kingdom			
Govt. Exp.	0.8	1.5	0.4
Deficit	1.6	1.0	1.6
Debt	0.1	0.2	-0.1
Total	2.5	2.7	1.9
Observed Increase	8.2	8.2	8.2
France			
Govt. Exp.	0.8	1.7	0.5
Deficit	1.6	1.2	1.6
Debt	0.3	0.0	0.2
Total	2.7	2.9	2.3
Observed Increase	4.6	4.6	4.6
Italy			
Govt. Exp.	0.8	1.6	0.5
Deficit	1.5	1.3	1.6
Debt	0.3	-0.3	-0.5
Total	2.6	2.6	1.6
Observed Increase	7.5	7.5	7.5
Other Industrial Countries			
Govt. Exp.	0.7	1.4	0.3
Deficit	1.5	1.0	1.6
Debt	0.3	0.2	0.0
Total	2.5	2.6	1.9
Observed Increase	---	---	---
G-7 Average			
Govt. Exp.	0.8	1.2	0.2
Deficit	1.8	1.4	1.8
Debt	0.2	0.0	0.2
Total	2.8	2.6	2.2
Observed Increase	5.9	5.9	5.9

in the actual simulations, the results shown are estimates, based on the INTERMOD simulations, of the contribution of increased government expenditure among all the G-7 countries to the rise in world real interest rates between the 1970s and the 1980s. The first simulation (Figure 6) shows the real interest rate effects that are broadly consistent with the Keynesian model: agents are assumed to be myopic in determining their consumption, which is based primarily on current income and financial wealth.[7] In Canadâ, the G-7 country in which the three components of fiscal policy were on balance the most expansionary, the rise in government spending is estimated to have directly contributed 0.7 percentage points to the 5 percentage point rise in Canadian real interest rates between the 1970s and the late 1980s. The additional effect of higher deficits, due largely to the drop in the share of taxes in GDP, added 2.1 percentage points to the rise in real interest rates resulting from higher government expenditure.

The accumulation of public debt accounts for only 0.2 percentage points of the increase in Canada's real interest rates, for a total effect from changes in fiscal policy of 3 percentage points. There are two reasons for the small effect associated with the change in public debt, a pattern that reappears for most other countries. First, holdings of government bonds are a small fraction of total real wealth, averaging just 2.7 per cent of total wealth in Canada over the 1980-89 period and 3.3 per cent for the G-7 group.[8] Changes in the stock of public debt thus have little impact on private consumption, which is determined mainly by current disposable income and the other components of financial wealth. Second, as shown in Figure 7, the increase in government debt sharply raises debt service payments, requiring higher tax rates to satisfy the government's budget constraint. The resulting drop in current disposable income offsets some or all of the effect on real interest rates of greater financial wealth. Indeed, in the first years of the simulation, this effect is often so strong that the contribution of higher public debt is actually negative.

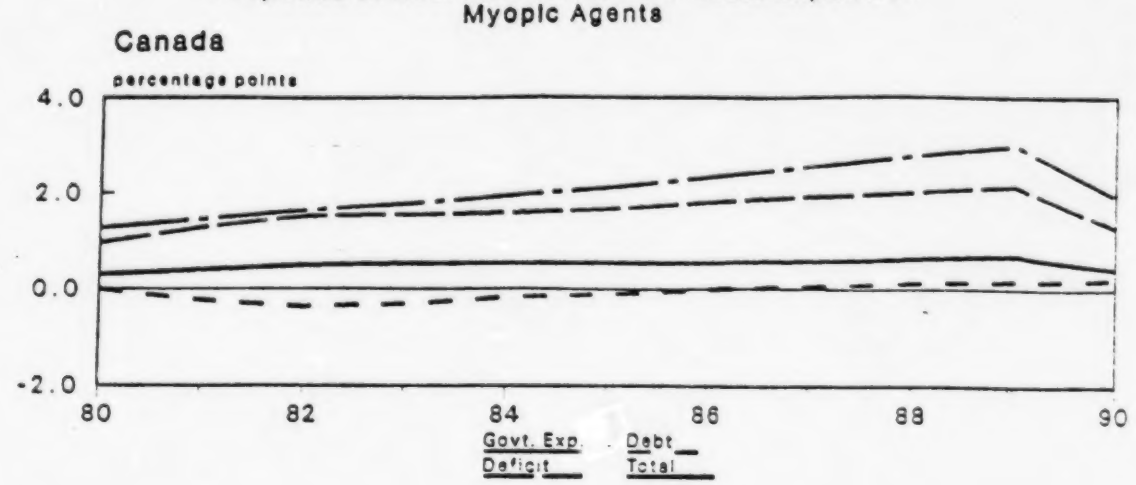
The similarity of results across countries is a significant feature of the simulation: although Canada experienced the largest fiscal shock, the response of real interest rates in

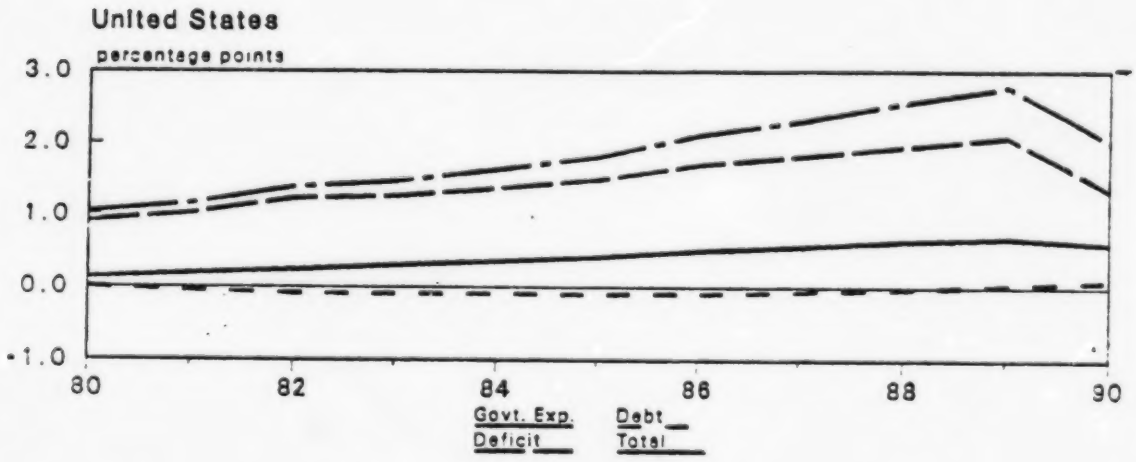
---

7. For a discussion of the structure and properties of INTERMOD, see Guy Meredith, 'Intermod 2.0: Model Specification and Simulation Properties,' Department of Finance Working Paper No. 89-7, (Ottawa. Department of Finance, 1989).

8.The ratio of public debt to total wealth, which includes physical capital, money balances, foreign assets, and the discounted value of future labour income in addition to government bonds, averages 4.3 for the United States, 2% for France, 2.4% for Germany, 16.3% for Italy, and 3.1% for Japan.

Figure 6
Response of Real Interest Rate to Fiscal Expansion
Myopic Agents





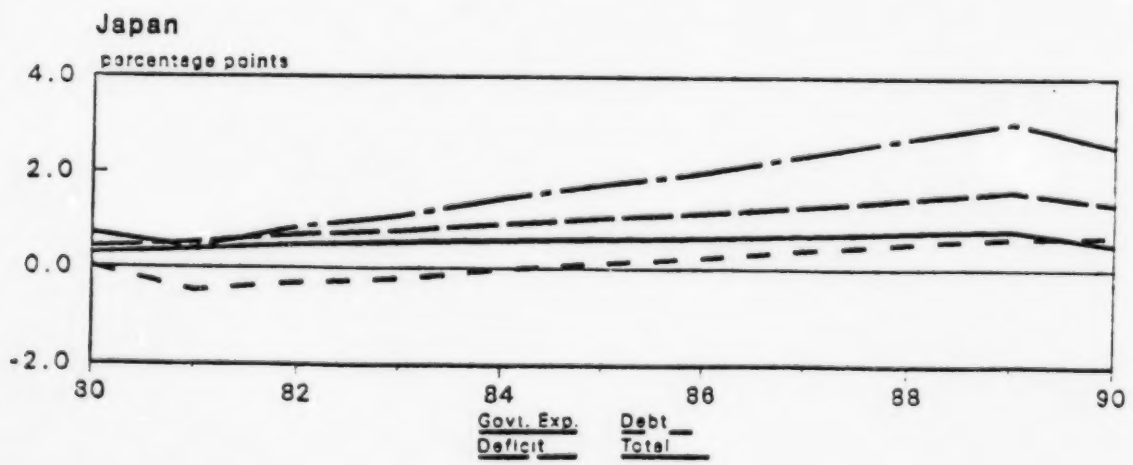
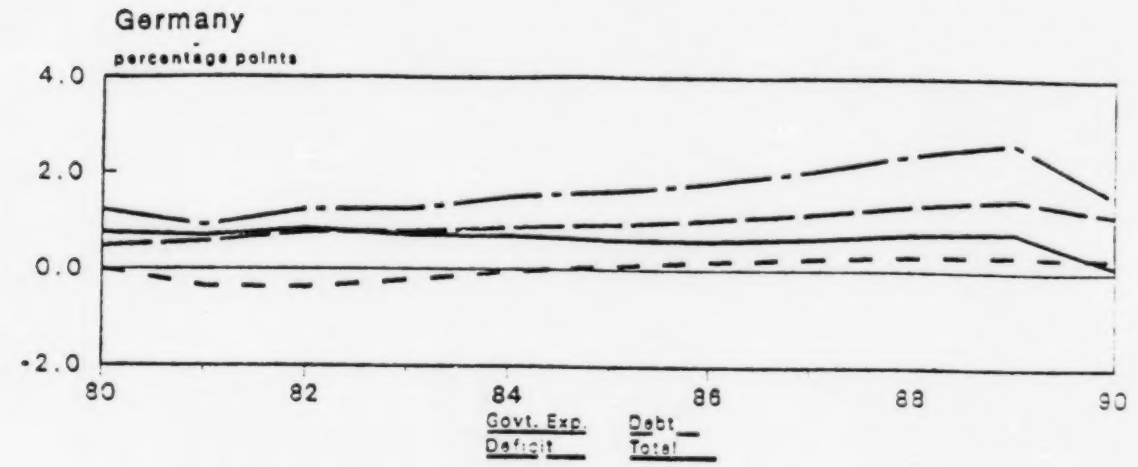
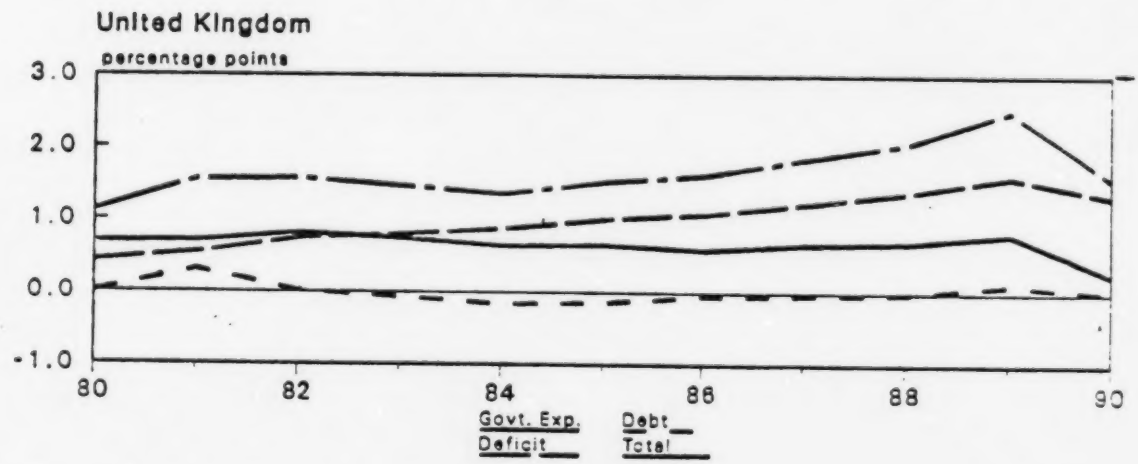


Figure 6 (con'd)





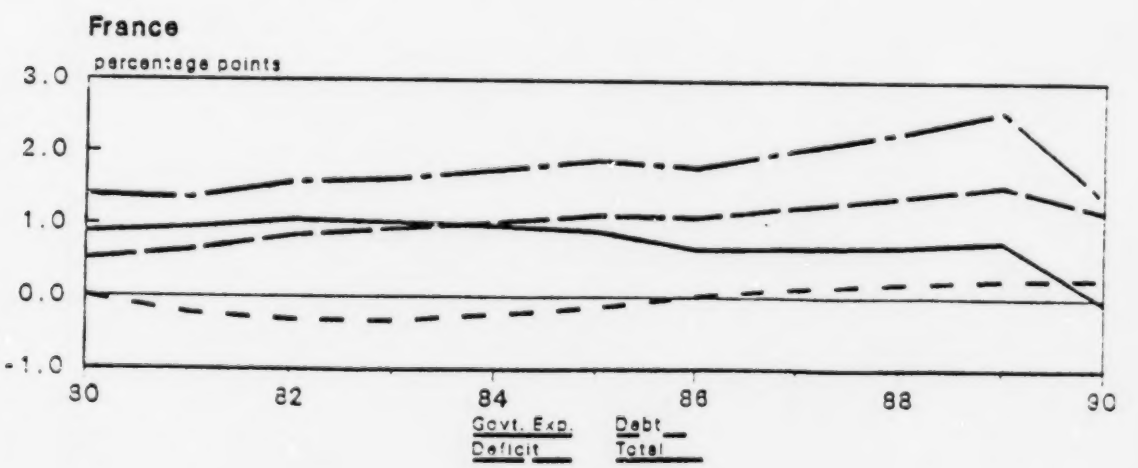
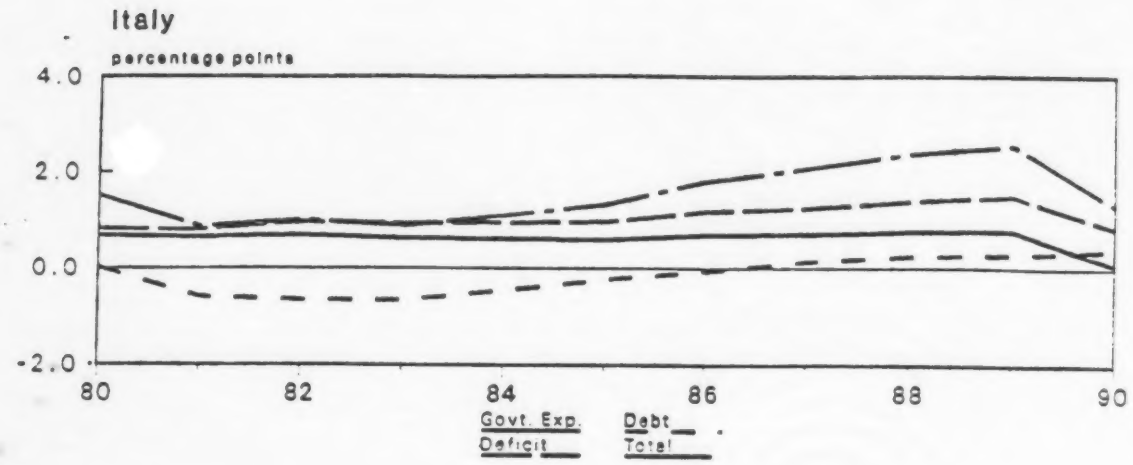
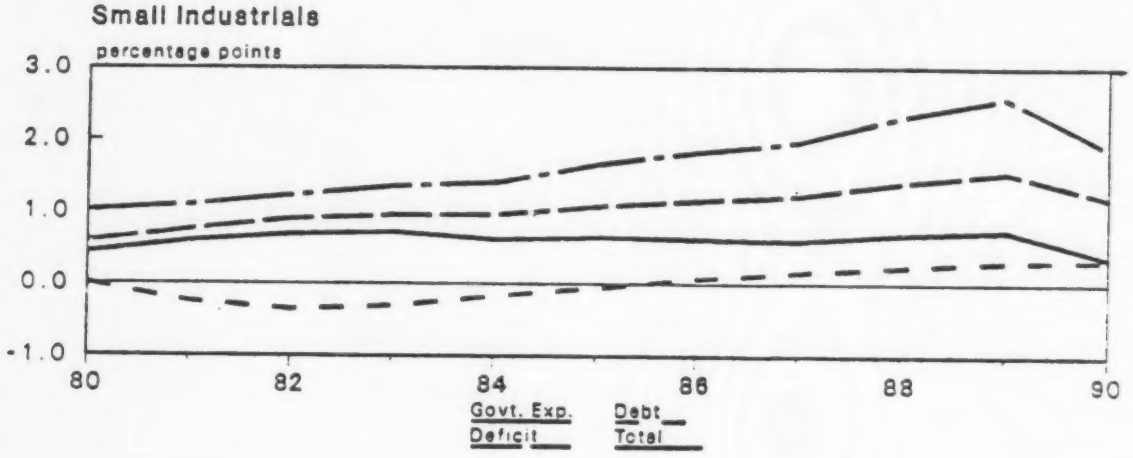


Figure 6 (con'd)





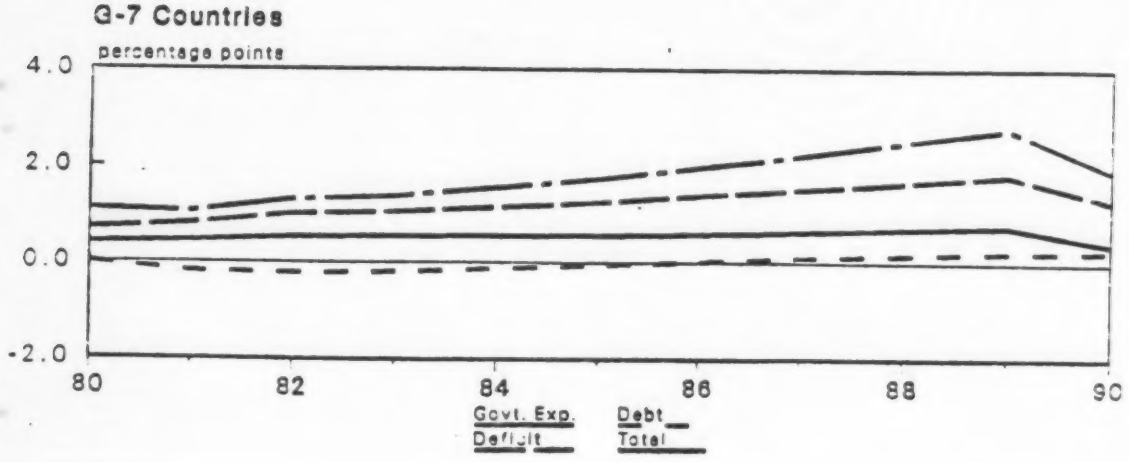
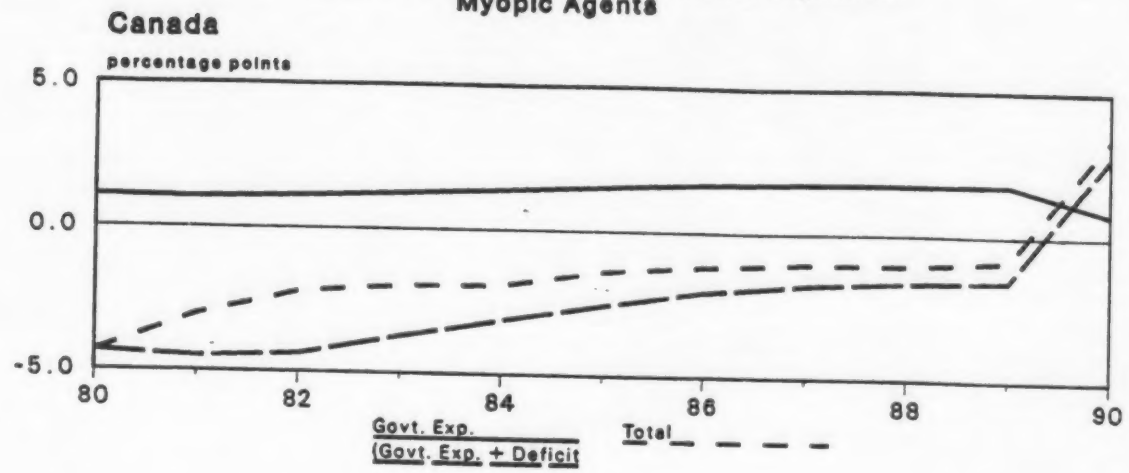
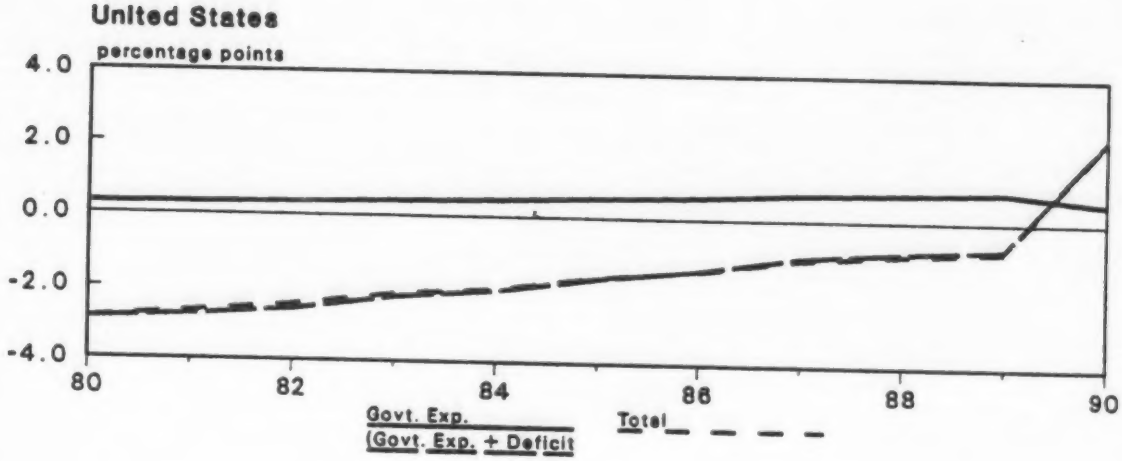


Figure 7
Response of Average Tax Rate to Fiscal Expansion
Myopic Agents





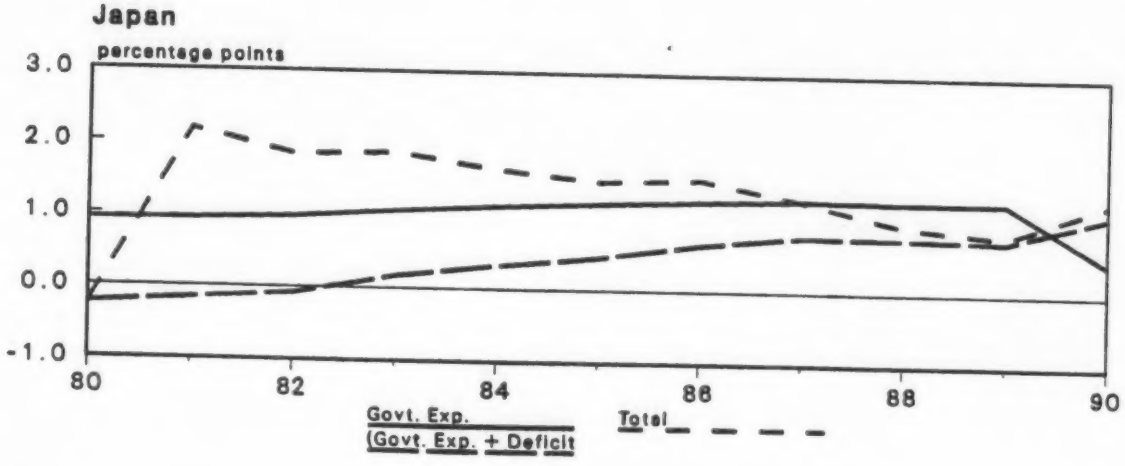
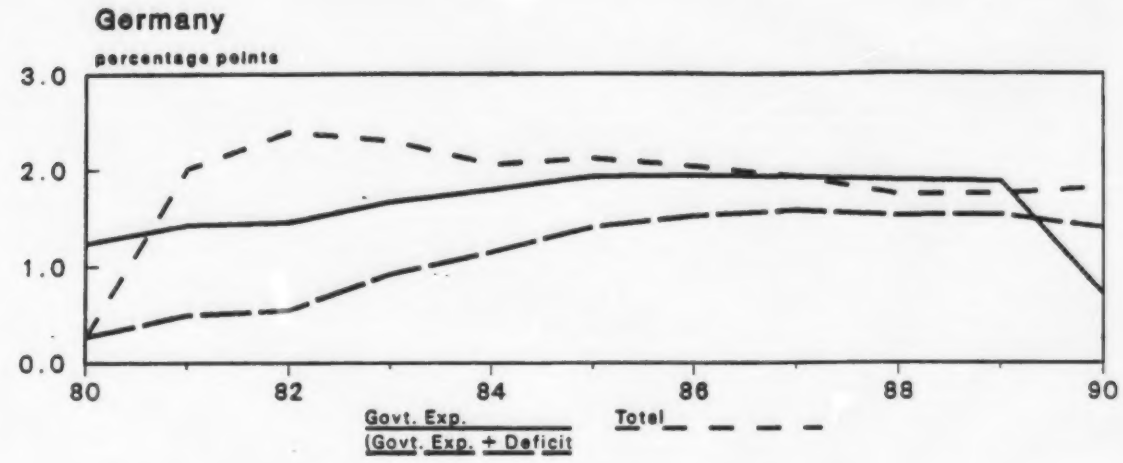
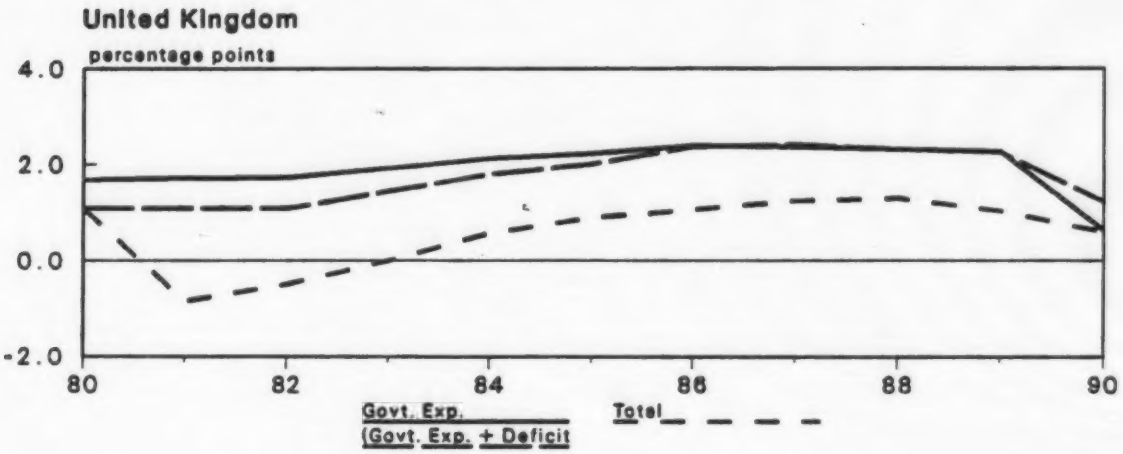


Figure 7 (con'd)





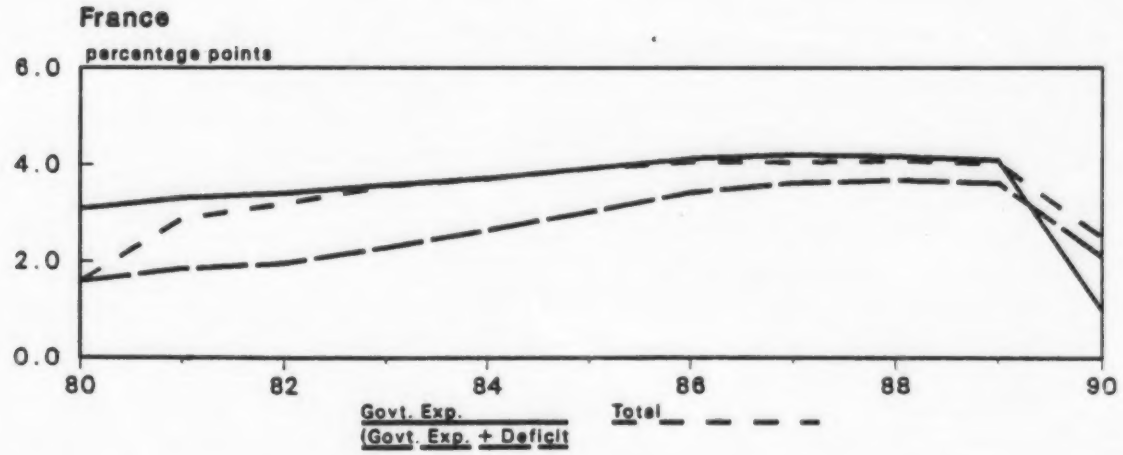
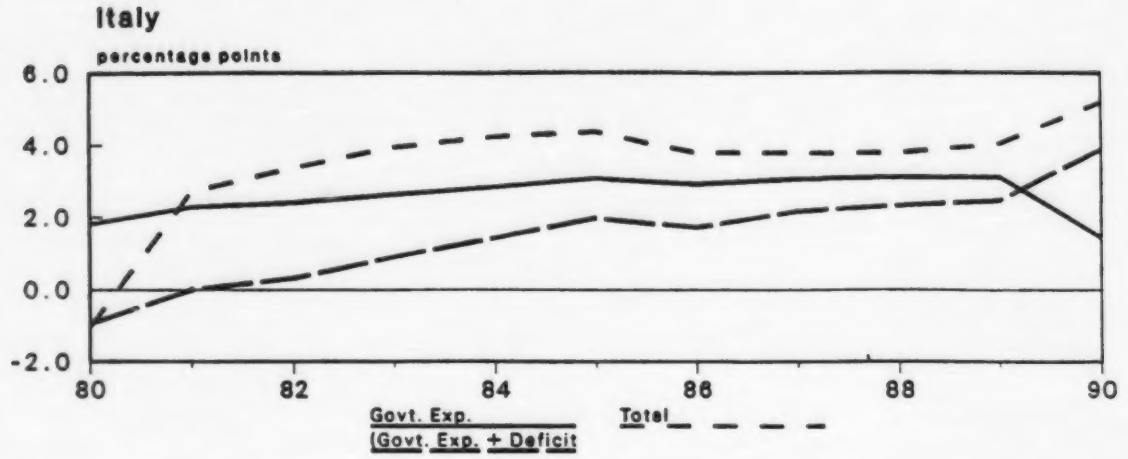
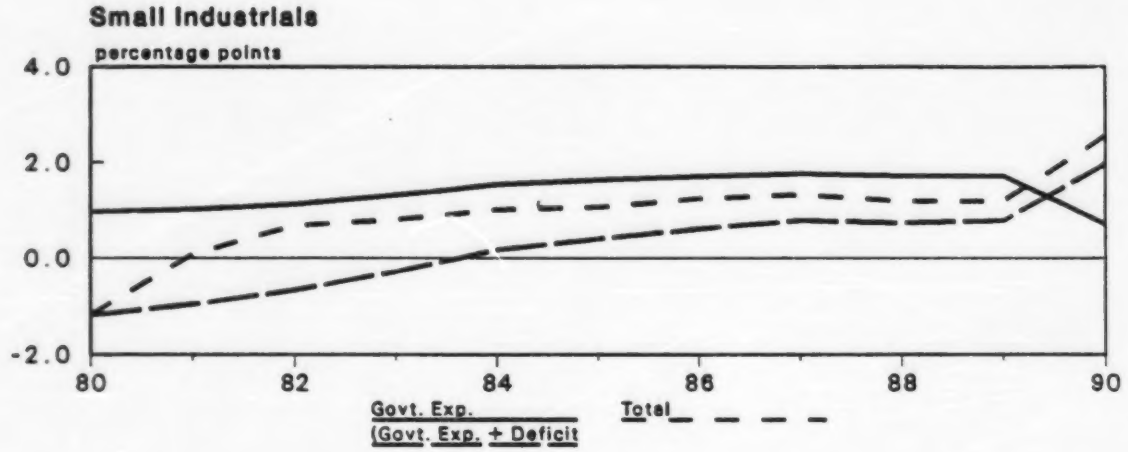
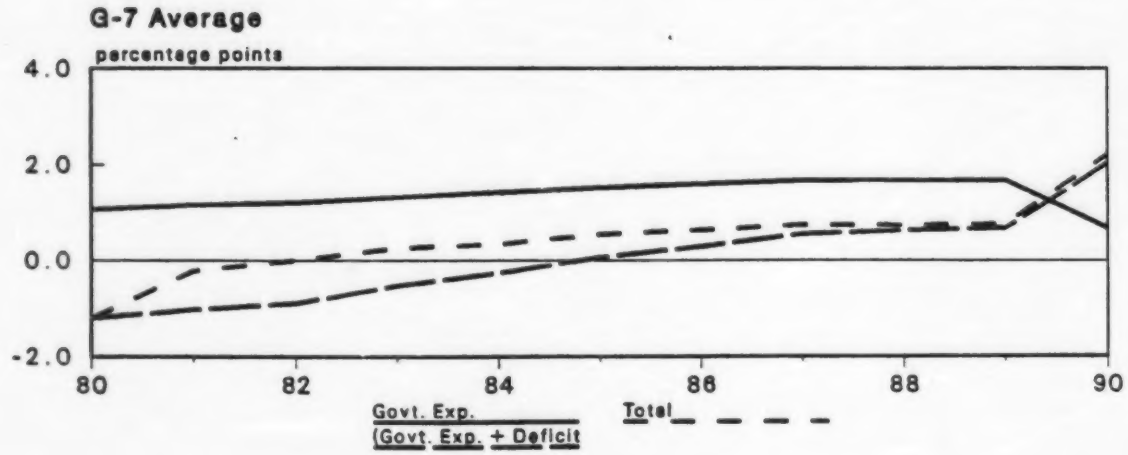


Figure 7 (con'd)







Canada was quite similar to the responses of other G-7 countries. Changes in government behaviour accounted for 2.8 percentage points of the rise in U.S. real interest rates between 1970-79 and 1980-89 according to the INTERMOD simulations, with the rise in budget deficits having the largest single effect. The smallest impact was in the United Kingdom, where the small changes in government expenditure and budget deficits raised real rates by only 2.5 percentage points. The narrow range in real interest rate responses, despite sharp differences in the magnitude of the shocks applied to the various countries, reflect the importance of the international real interest rate linkages resulting from capital mobility.[9] They also illustrate the importance of analyzing fiscal developments throughout the G-7 countries when explaining real interest rate movements in any of its members.

These simulations suggest that the rise in government budget deficits added an average of 1.8 percentage points to real interest rates in the G-7 countries: the rise in expenditure contributed 0.8 percentage points and public debt 0.2 percentage points, for a total of 2.8 percentage points

4.3 Simulation Results with Forward-Looking Agents

To illustrate how the relationship between shifts in fiscal policy and real interest rates may be modified if agents are forward-looking, rather than myopic as typically assumed in Keynesian models, two additional simulations (again described in Table 2) were conducted using alternative versions of the model. In these versions of the model, agents' consumption is related to future disposable income (i.e., human wealth) in addition to current disposable income and financial wealth.[10] This assumption implies that a portion of the future tax liabilities arising from the accumulation of public debt is perceived by agents as a reduction in wealth.[11] The first alternative simulation is intended to illustrate the

---

9.Recall that the simulations were conducted by reducing government expenditure, deficits, and debt in each G-7 country to the levels prevailing in that particular country during the 1970s. Thus, the shock applied to a particular country differs from that applied to the other members of the G-7.

10.Although the majority of agents are forward-looking in these simulations and base their consumption decisions on future disposable income, approximately 25 per cent of agents are myopic, or are liquidity constrained, consuming solely on the basis of current income and financial wealth.

11.Some of the newly issued government bonds are nonetheless perceived as augmenting net wealth. Following Olivier Blanchard, 'Debts, Deficits, and Finite Horizons,' The Journal of Political Economy, vol 93, No. 2, (1985), pp.223-47, agents in INTERMOD are assumed to discount future tax liabilities at a rate higher than the real risk-free interest rate, thereby taking into account the probability that they will die before paying all of the increased future taxes required to retire the additional public debt.

impact on real interest rates of a temporary fiscal expansion: as in the original simulation, government expenditure, budget deficits, and public debt are reduced over the 1980-89 period (as a share of GDP) by the difference between their average values in the 1970s and in the 1980s. Unlike the original simulation, however, agents are aware that all fiscal variables will return to their control values at the end of the 1980s.

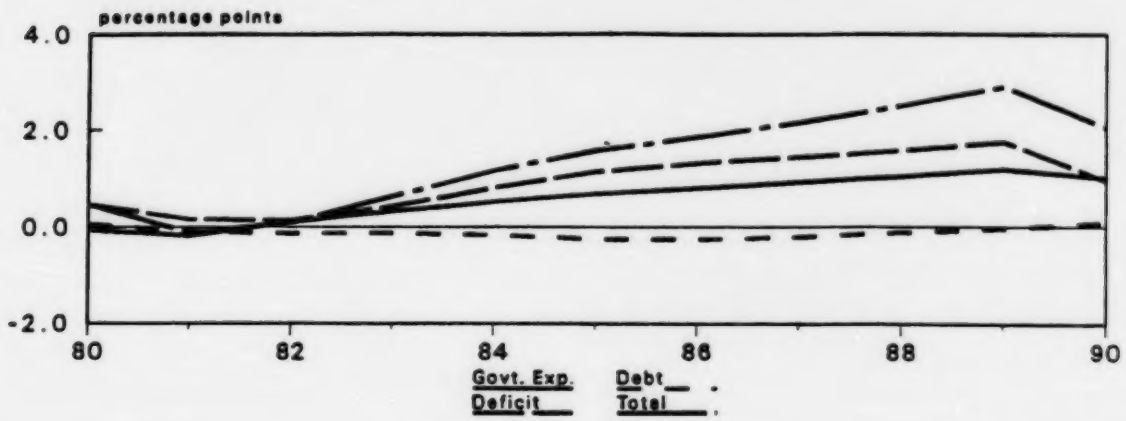
The various components of the temporary fiscal shock, shown in Figure 8 and in Table 2, each have much different effects on real interest rates when agents are forward-looking than when they are myopic. First, the temporary tax-financed increase in government expenditure that occurs in Step 1 of the simulation has a much stronger effect on real interest rates in the forward-looking simulation, although the impact builds up more gradually than when agents are myopic. The larger effect occurs because consumption is now related to both current and future disposable income, and is thus less affected by the temporary increase in taxes. This difference is especially large for the European members of the G-7, which had the largest increases in government expenditure and taxes, and is smallest for Canada, the United States, and Japan. The increase in real interest rates resulting from the tax-financed increase in government expenditure averages 1.2 percentage points across the G-7, whereas the effect was only 0.8 percentage points when agents were assumed to be myopic.

While the effect of increased government expenditure is larger when agents are forward-looking, the additional effect of higher budget deficits, given by the differences between Step 1 and Step 2 of the simulation, is considerably smaller. This is the case because the rise in consumption associated with the temporary tax reduction is less when agents consume on the basis of both current and future disposable income than when their consumption is constrained only by current income. The forward-looking assumption lowers the response of real interest rates to the increase in the deficit by amounts ranging from 0.6 percentage points for Japan, Germany, and the United Kingdom to only 0.2 percentage points for italy. The average effect on real interest rates of the increase in budget deficits is 1.4 percentage points for the G-7, compared with 1.8 percentage points in the simulation with myopic agents.

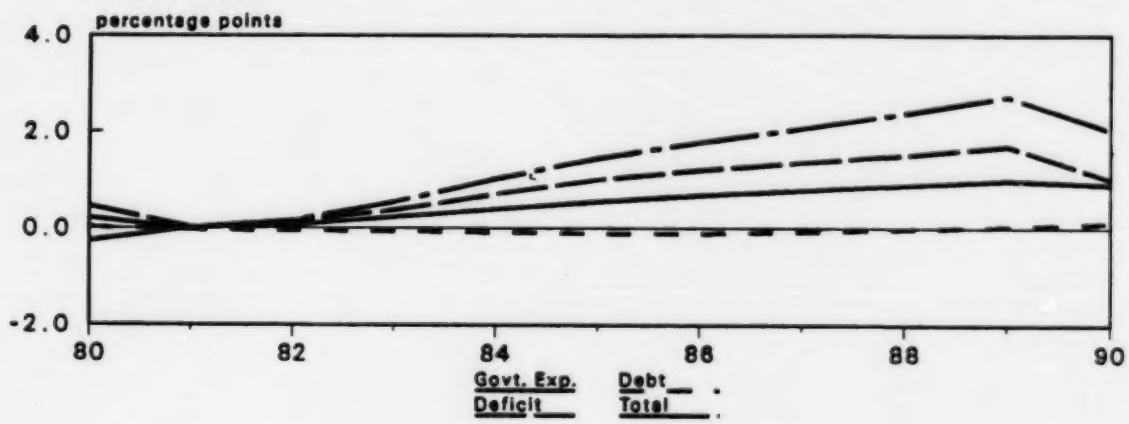
Finally, the rise in the stock of public debt has a much smaller impact on real interest rates, since agents reduce their consumption in proportion to higher future tax liabilities. The assumption that agents are forward-looking naturally made the greatest

Figure 8
Response of Real Interest Rate to Temporary Fiscal Expansion
Foreward-Looking Agents

Canada



United States



Japan

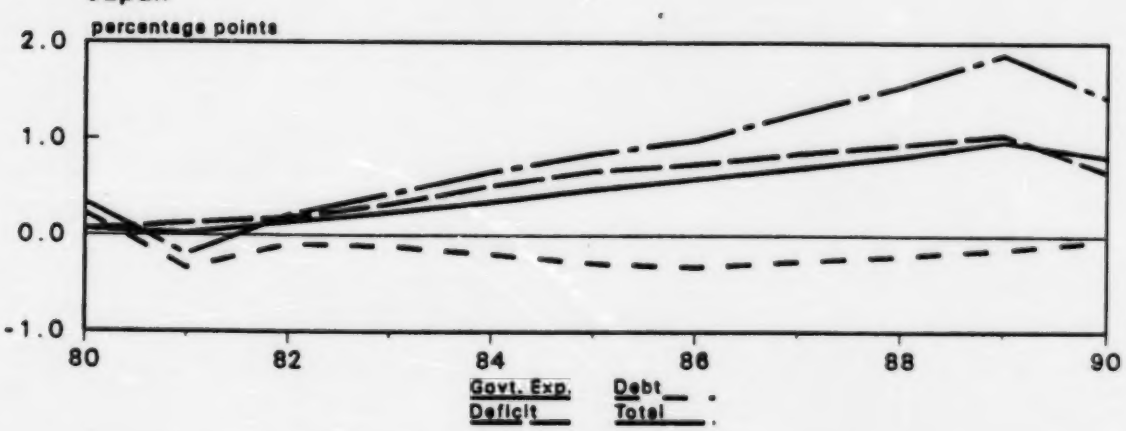
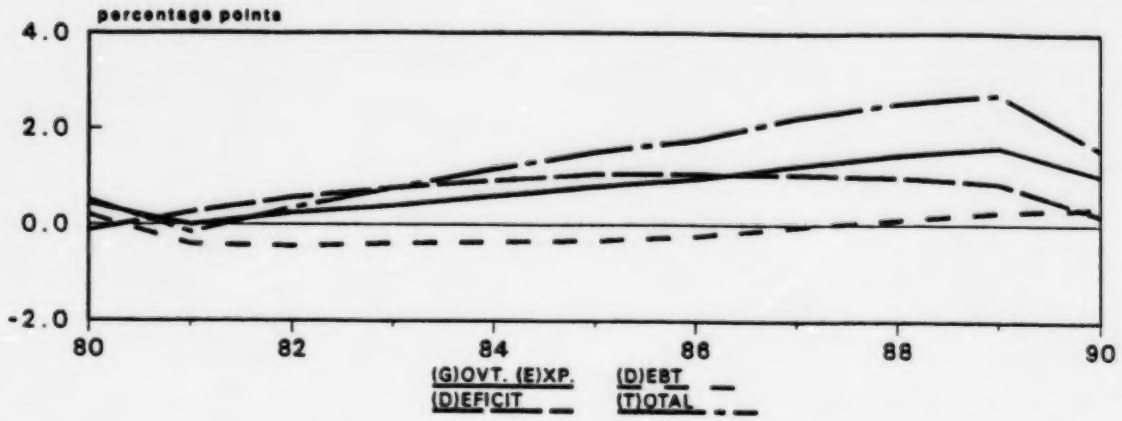
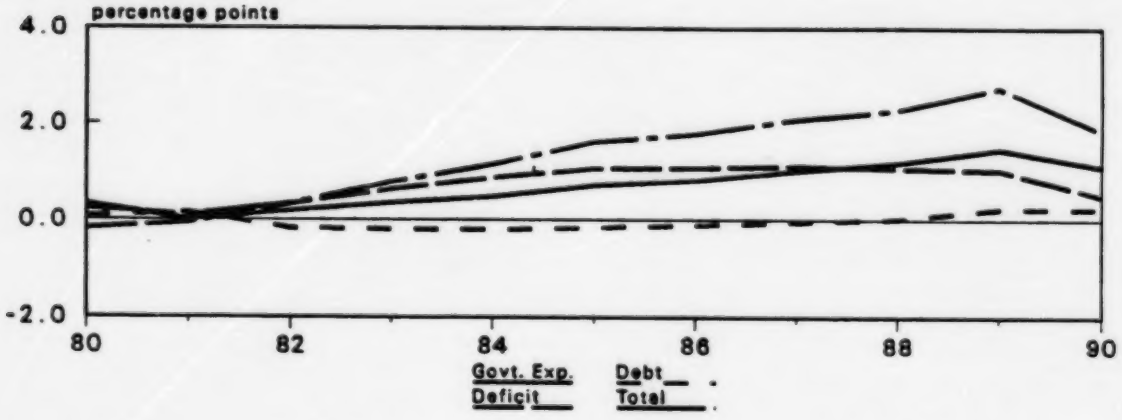


Figure 8 (con'd)

Germany



United Kingdom



France

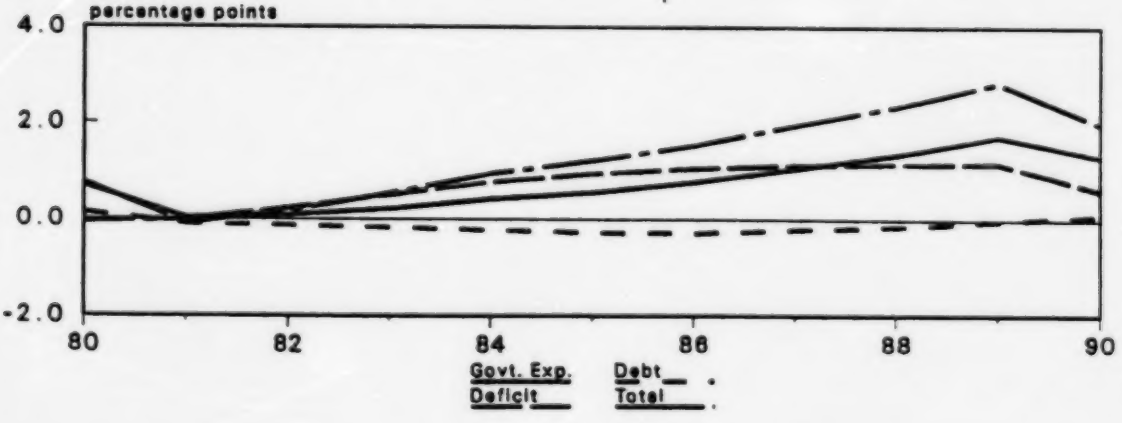
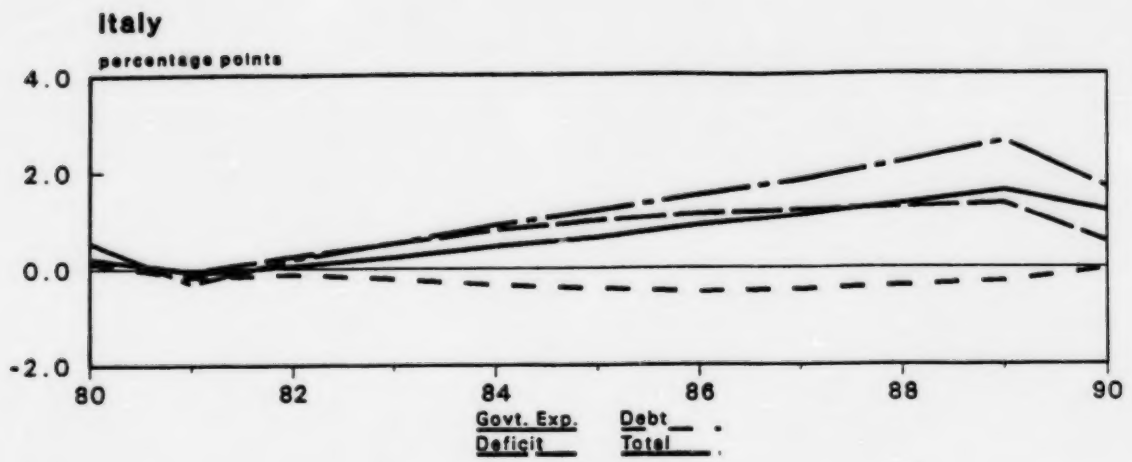
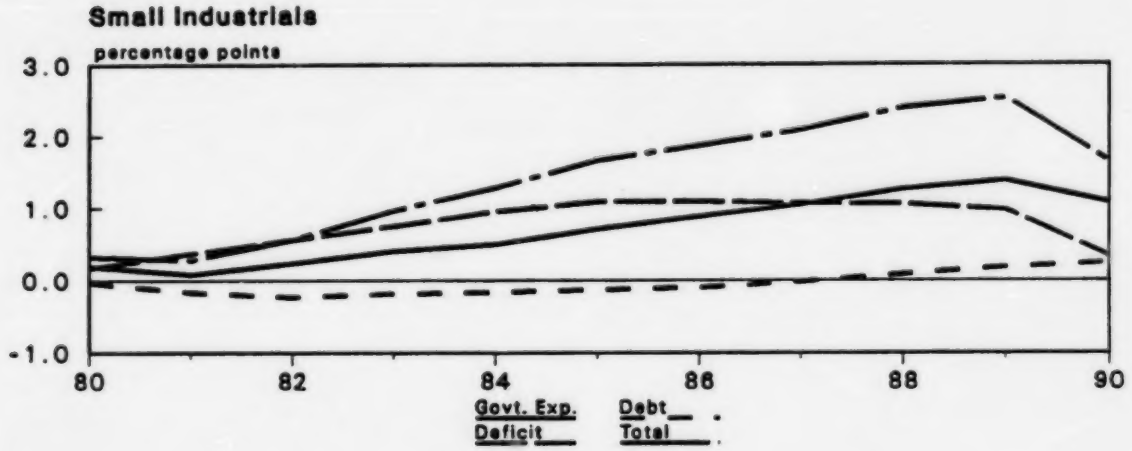
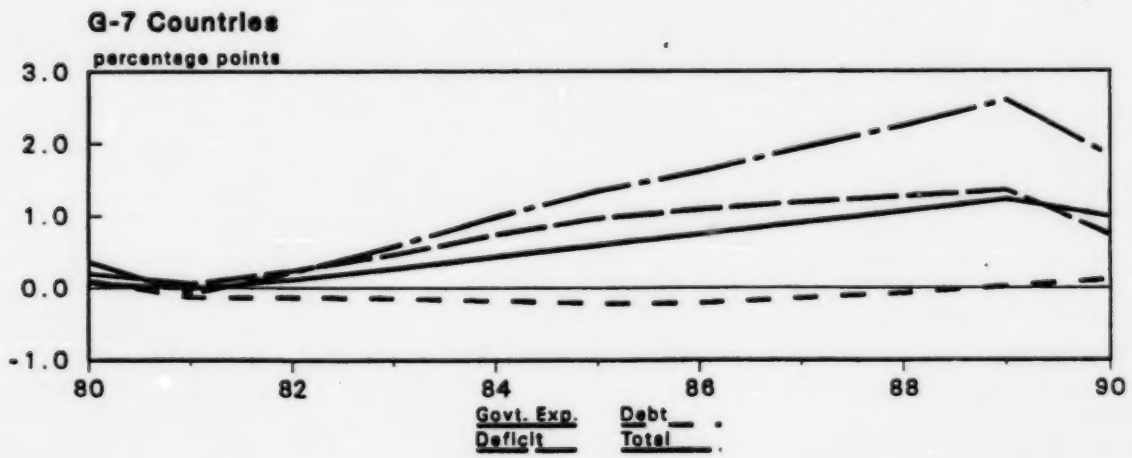


Figure 8 (con'd)







difference in the simulations for Japan and Italy, since the shock to public debt was largest for these two countries: the simulation shows real interest rates actually declining in 1989 by 0.1 percentage points in Japan and by 0.3 percentage points in Italy as a result of the build-up of public debt during the 1980s. These negative responses are not due to an excessive reduction in consumption in anticipation of future tax increases, however, but rather to the large increases in current taxes required to pay the interest charges on the additional debt. Increased public debt raised real interest rates by an average of 0.2 percentage points for the G-7 as a whole when agents were assumed to be myopic, but the effect is negligible when agents are forward-looking.

Owing to the small effect from the changes in public debt in most industrial countries, the net effect of shifts in fiscal policy on real interest rates, compared with the initial simulation, depends largely on the relative magnitudes of the increase in government expenditure and the rise in the deficit. If the rise in the deficit exceeds the increase in government expenditure -- that is, tax rates register a net decline in the simulation -- the increase in real interest rates will be smaller than in the initial simulation. On the other hand, if the rise in the deficit is smaller than the increase in government expenditure (taxes increase), then the effect on interest rates will be larger when agents are forward-looking than when they are myopic.

Figure 9, which shows the response of the average tax rate in each step of the simulation, can thus be used to explain some of the differences among the G-7 countries in the magnitude of the overall real interest rate response. For the United States, which experienced significant tax reductions, the total impact of expansionary fiscal policy was slightly smaller than in the previous simulation. Taxes increased in Germany, France, the United Kingdom, and the small industrial countries, however, since the shocks to their government budget deficits were smaller than those to government expenditure. As a result, the impact of expansionary fiscal policy on real interest rates was larger for these countries than in the first simulation. The results for the G-7 as a whole are dominated by the response of real interest rates in the United States: real interest rates in the G-7 countries rise by an average of 2.6 percentage points in this simulation, versus 2.8 percentage points when agents are assumed to be myopic.

Our theoretical discussion noted that if agents are forward looking, then the impact of expansionary fiscal policy on real interest rates depends crucially on the perceived

Figure 9
Response of Average Tax Rate to Temporary Fiscal Expansion
Foreward-Looking Agents

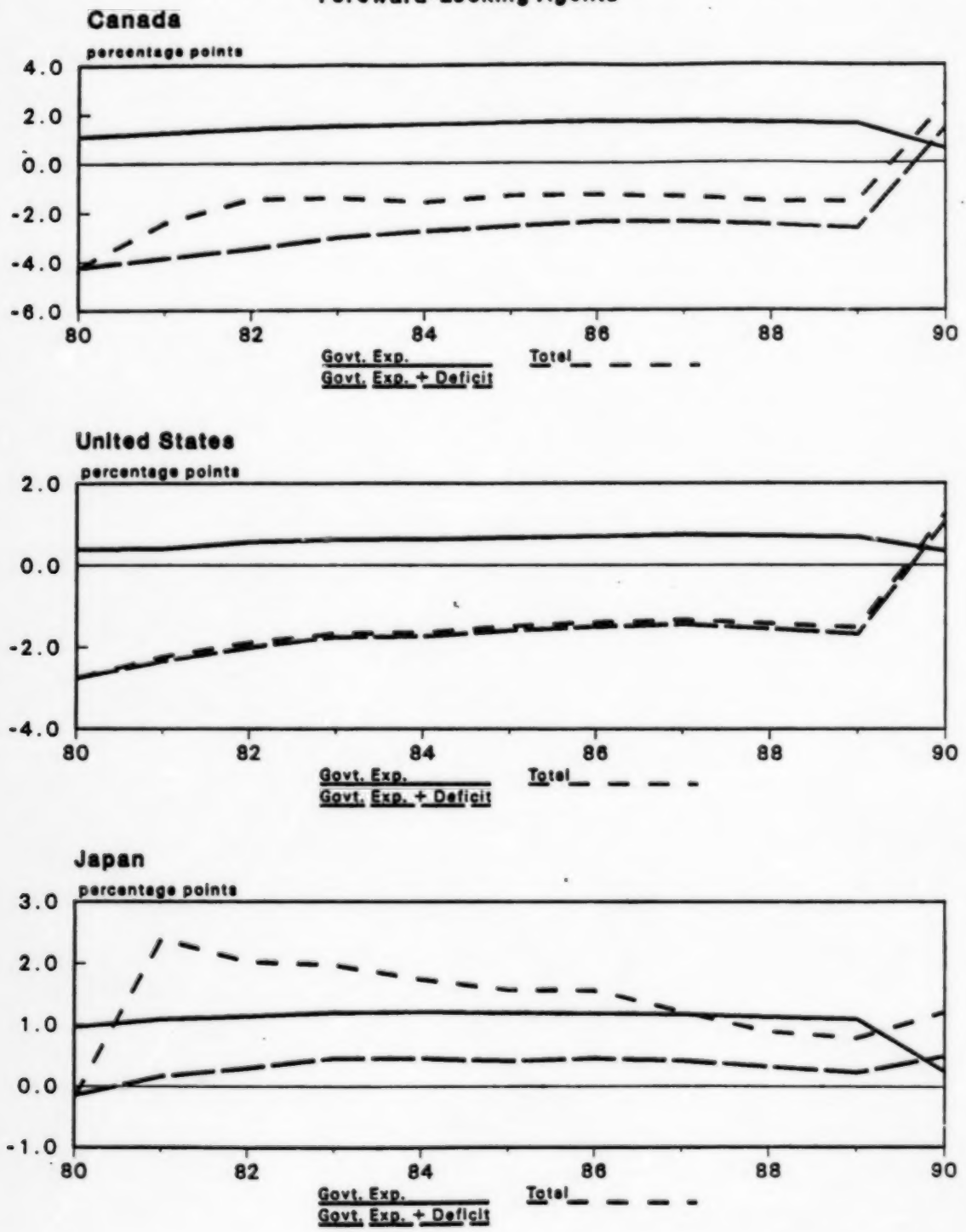
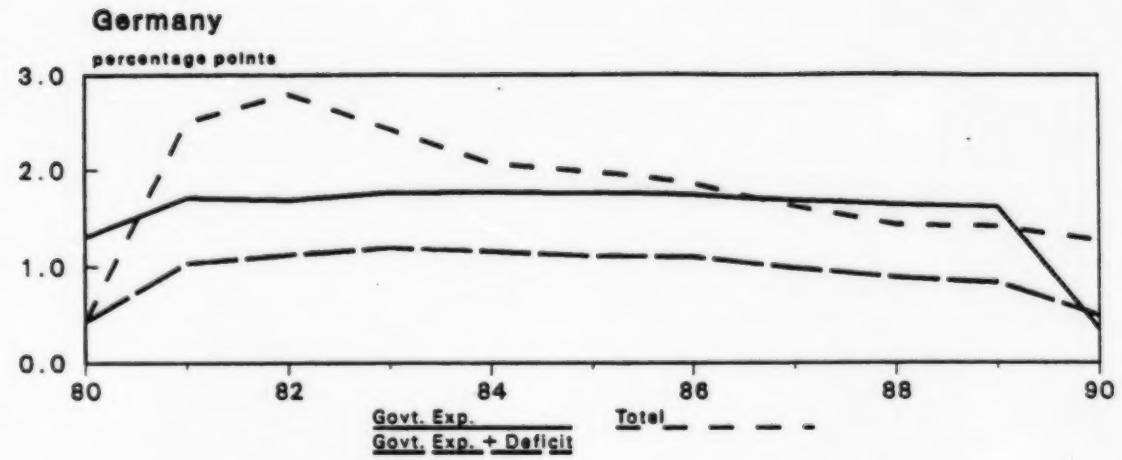
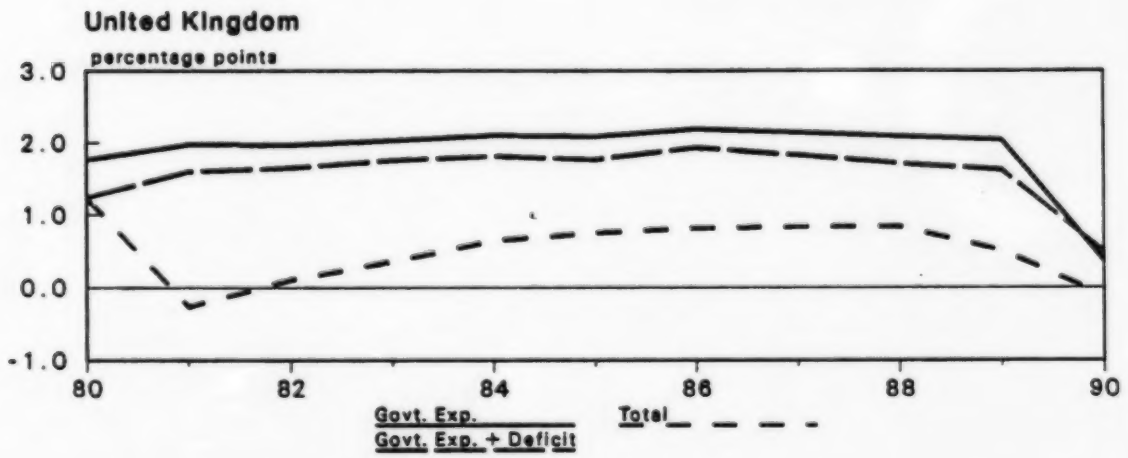


Figure 9 (con'd)





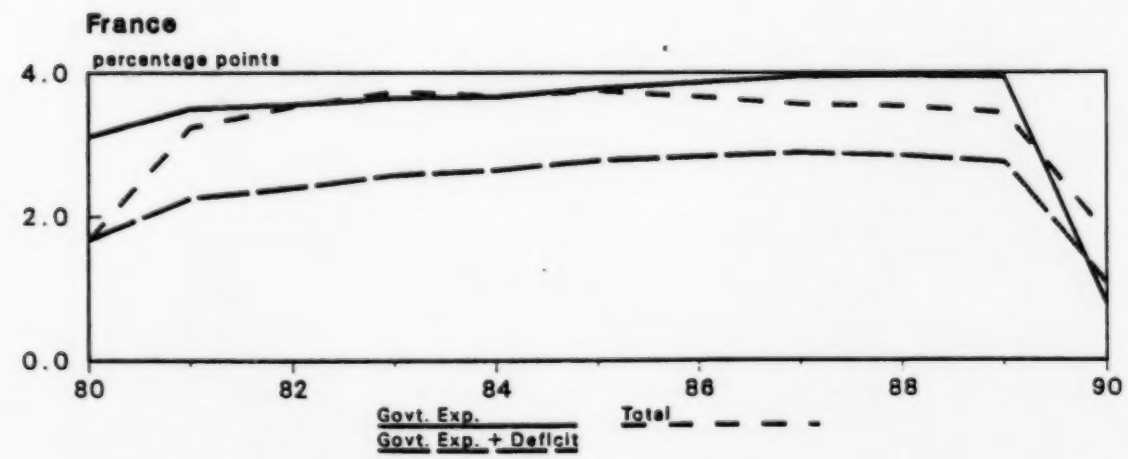
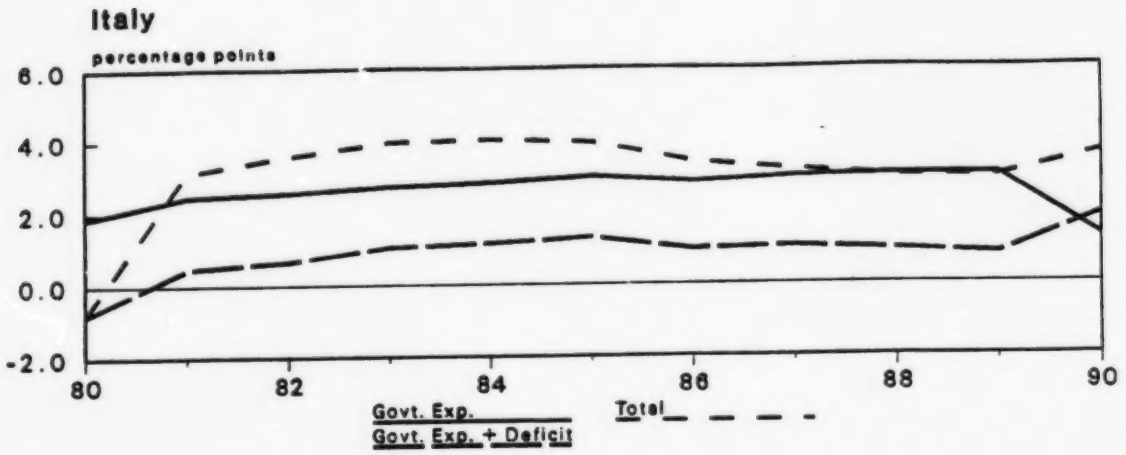
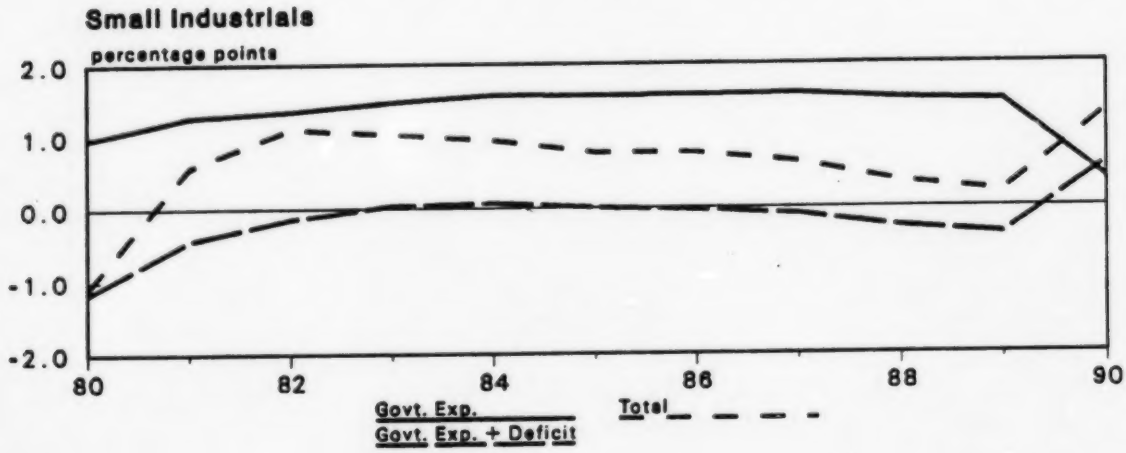
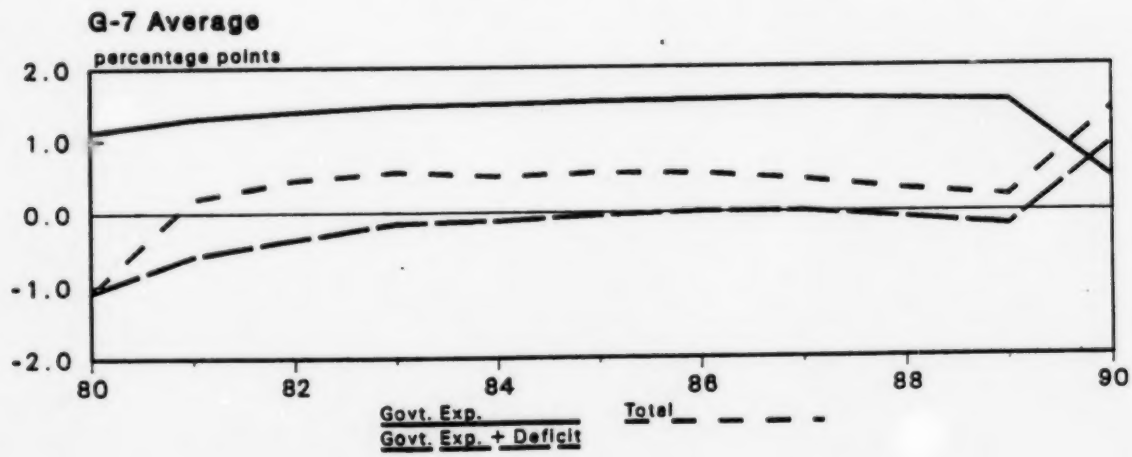


Figure 9 (con'd)







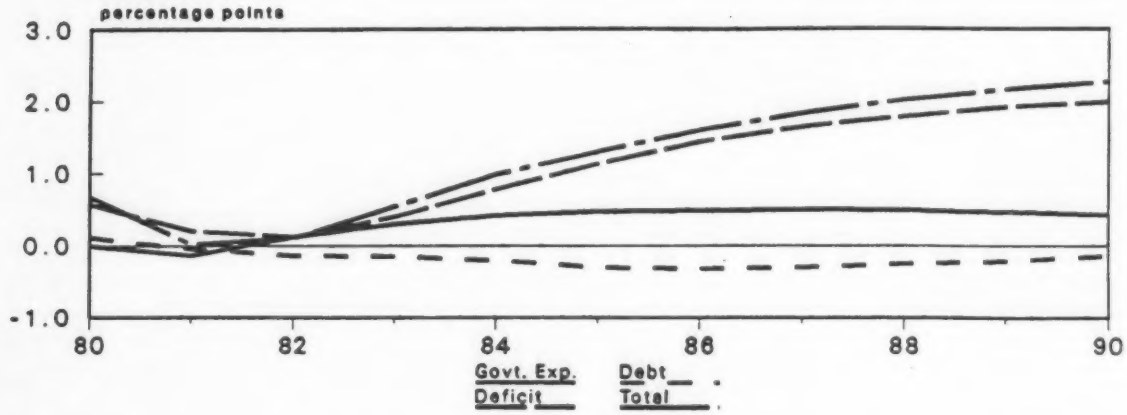
permanence of the policy change. In order to compare the impacts on real interest rates of fiscal shocks of various durations, we have conducted a simulation in which, beginning in 1980, the three main fiscal policy variables were permanently reduced in every industrial country by the difference between their average values in 1980-87 and in 1970-79. As shown in Figure 10 (and once again summarized in Table 2), the net effect of expansionary fiscal policy on real interest rates in this simulation is considerably smaller than in the two previous simulations. Higher-government expenditure, deficits, and public debt raised real interest rates across the G-7 by a total of 2.2 percentage points, versus 2.8 percentage points in the simulation where agents were myopic, and 2.6 percentage points when the fiscal shocks were viewed as temporary. As in the first simulation, there was only minor variation among industrial countries in the magnitude of the real interest rate response -- changes in real interest rates ranged from 1.5 percentage points for Japan to 2.3 percentage points for the United States.

The smaller size of the total real interest rate effect may be traced in part to the modest increase in real interest rates resulting from the tax-financed rise in government expenditure. While higher government expenditure among the G-7 countries raised interest rates by 0.7 percentage points in the initial simulation, and a temporary increase in government expenditure raised real rates by 1.2 percentage points in the first simulation with forward-looking agents, this simulation suggests that a permanent increase in government expenditure would raise real rates by only 0.2 percentage points. One reason behind this small response is that agents' human wealth, and hence consumption, is reduced more by a permanent tax-financed increase in government expenditure than by a temporary increase. Furthermore, while the increased government expenditure was highly expansionary in the first (essentially Keynesian) simulation, the forward-looking agents of this simulation recognize that the fiscal expansion will have no permanent effects on output, which in the long-run is determined by the economy's factor endowments.

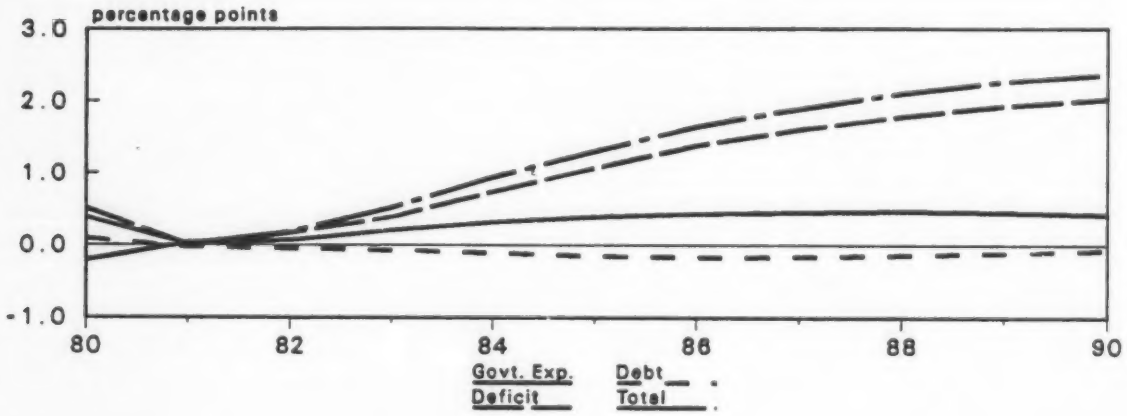
The absence of a long-run increase in output in the forward-looking simulation has important implications for the short-run behaviour of real interest rates, as much of the increase in real interest rates in the simulation with myopic agents is conditional upon agents' expectations of continued higher output from the fiscal expansion. In particular, an important mechanism by which real interest rates were increased in the initial simulation -- the rise in investment due to the expectation of higher future output -- is rendered much

Figure 10
Response of Real Interest Rate to Permanent Fiscal Expansion
Foreward-Looking Agents

Canada



United States



Japan

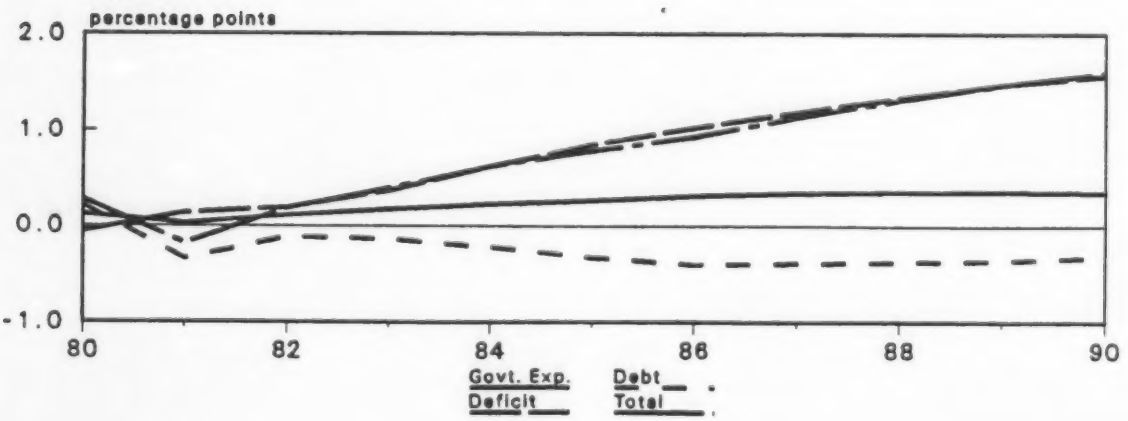
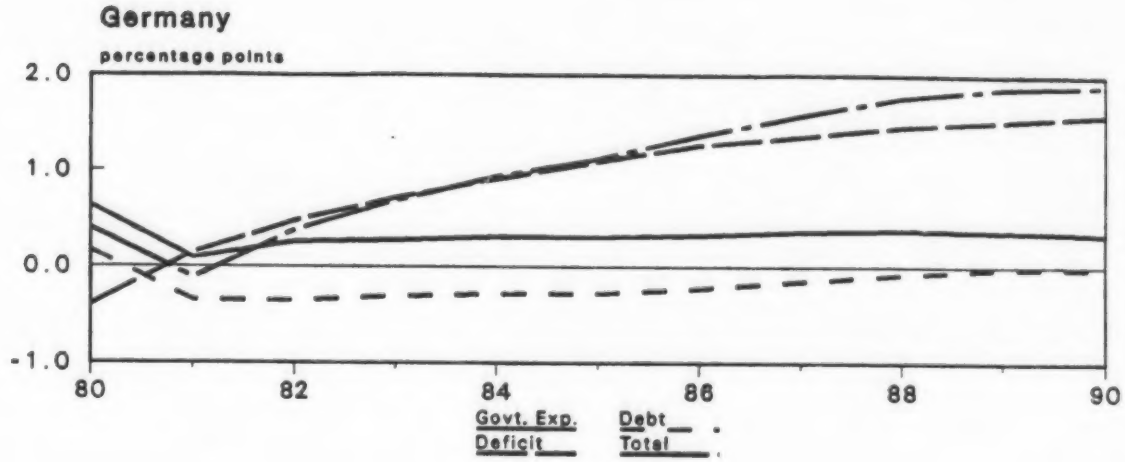
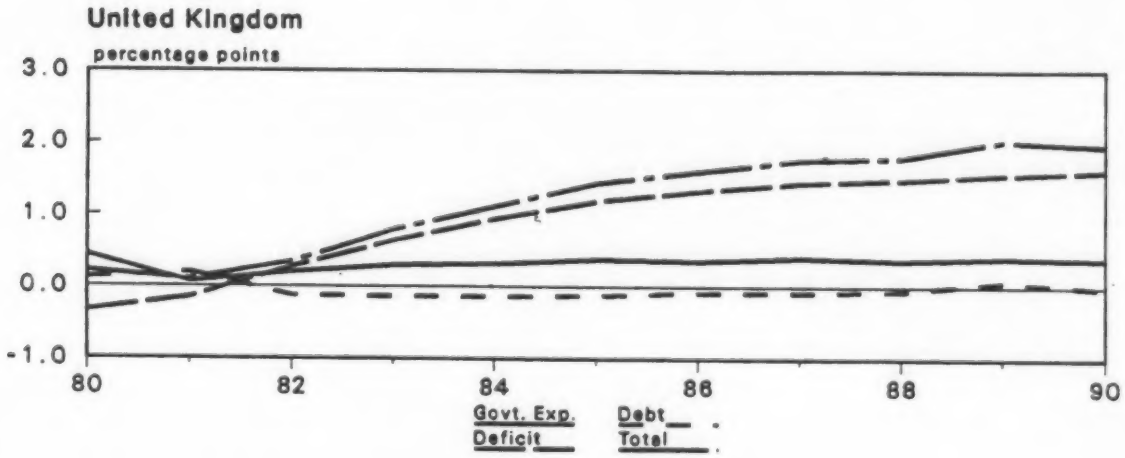


Figure 10 (con'd)





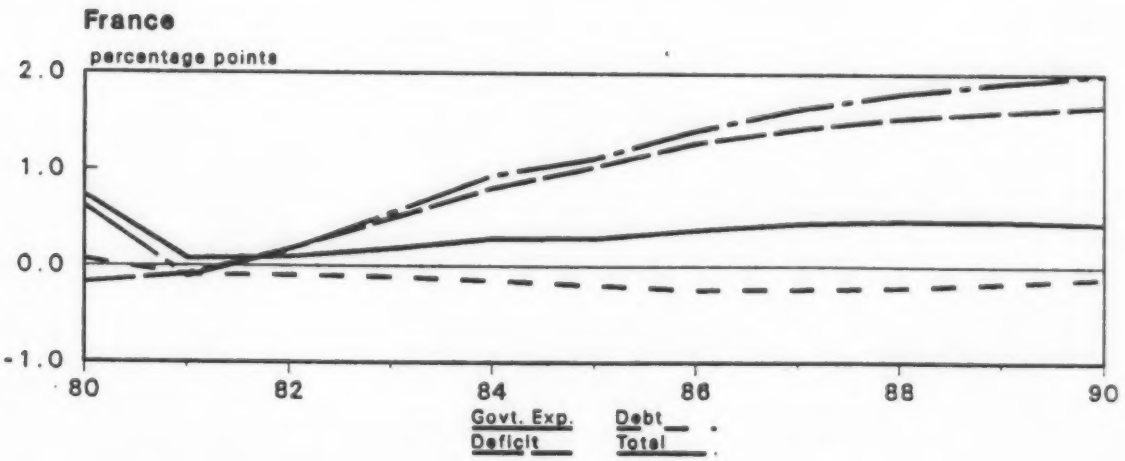
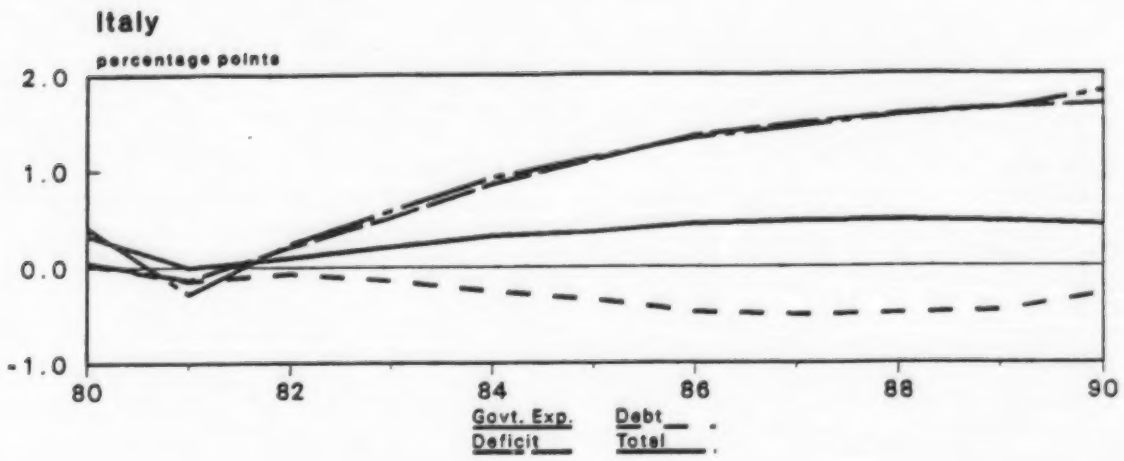
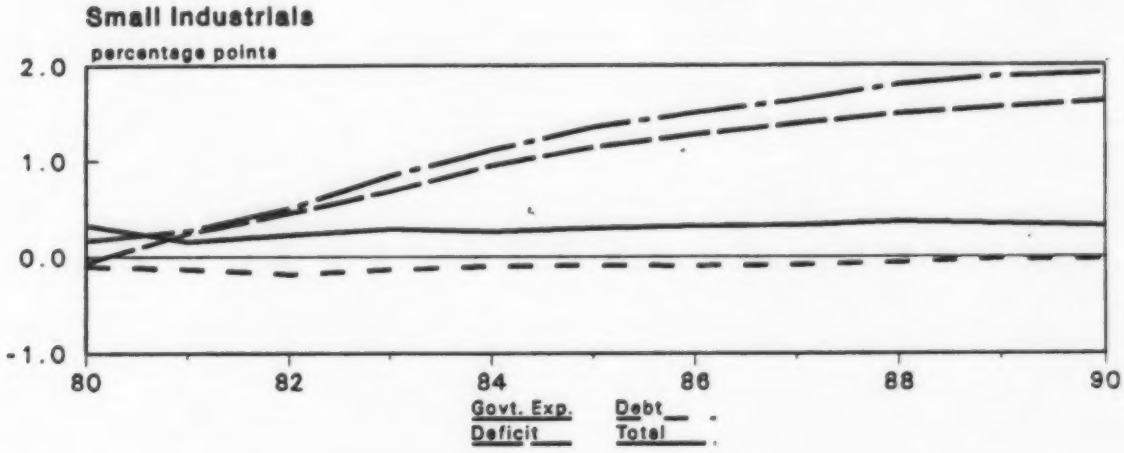
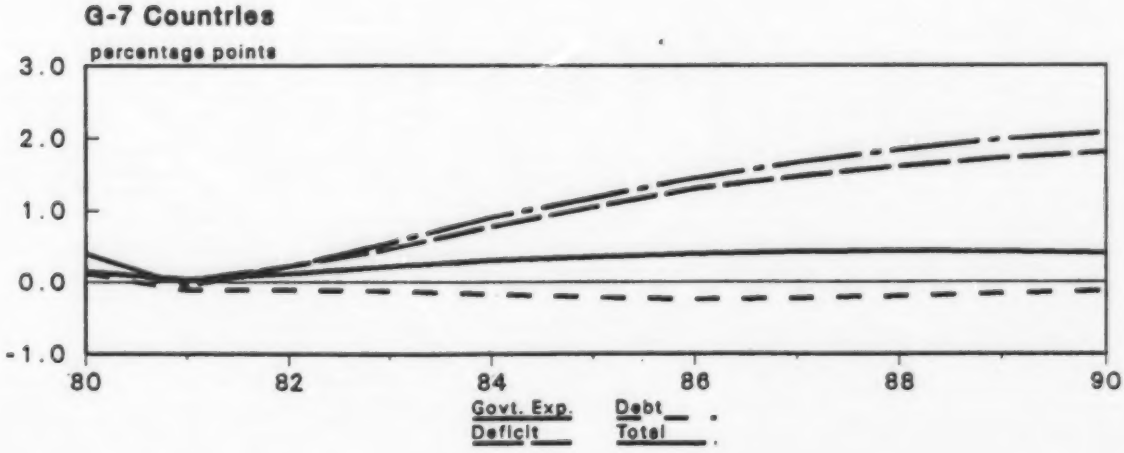


Figure 10 (con'd)







weaker by the assumption that agents correctly foresee the negligible long-run output effects of higher government expenditure.

An additional reason for the small total effect is the negative real interest rate response to the higher public debt observed for most industrial countries. As in the two earlier simulations, this is due to the fact that the higher debt service charges require increased tax rates in order to satisfy the government budget constraint; the resulting fall in disposable income lowers consumption and real interest rates. The longevity and pervasiveness of this phenomenon, compared with the previous two simulations, occurs because agents perceive that the permanent increase in the debt will ultimately translate into lower permanent income; the drop in consumption is thus greater than when agents were assumed to be myopic or the shock was temporary.

In summary, the results of the INTERMOD simulations suggest that increases in government expenditure during the 1980s, and particularly the accompanying rise in budget deficits and accumulation of debt, can account for between 2.2 and 2.8 percentage points of the observed increase of 5 percentage points in world real interest rates between the 1970s and the 1980s. The increase in budget deficits had the largest single effect, accounting for between 1.4 percentage points and 1.9 percentage points of the increase in real rates, while between 0.2 percentage points and 1.2 percentage points can be attributed to higher government expenditure. The contribution of increased public debt in the 1980s ranged from zero to 0.2 percentage points. These results are based on alternative assumptions about agents' planning horizons and the perceived permanence of the shock.

5. Results from Other Studies

The discussion of INTERMOD simulations has demonstrated that, for a range of assumptions concerning agents' planning horizons, the proposition that increases in government expenditure, higher deficits, and greater public debt contribute to higher real interest rates is consistent with the workings of a multi-country macroeconomic model. In this section, we compare the results obtained in the INTERMOD simulations with those of a number of other well-known models and review several studies of the relationship between government expenditure, budget deficits, and real interest rates.

In a recent study of the impact of changes in fiscal policy on investment expenditure, Herd (1989) compares the predictions of 10 national macroeconomic models regarding the effects on interest rates of a reduction in government expenditure equal to 1 per cent of GDP[12]. Table 3 shows the simulation results from the national macroeconomic models for five members of the G-7, together with the results of similar simulations conducted using INTERMOD and the OECD's INTERLINK model. These simulations differ from those of the earlier INTERMOD simulations because the changes to government expenditure apply here only to the country under consideration; in the previous INTERMOD simulations the shocks to government expenditure occur simultaneously in all industrial countries. Despite this difference in approach, the results of the simulations broadly support the view that, for a given nominal money supply, increases in government expenditure raise real interest rates: a drop in government expenditure equal to 1 per cent of GDP can lower real interest rates by an average of 0.9 percentage points in the industrial countries over 5 years. According to the national models, the effect of such a fiscal contraction is to lower real interest rates in Canada by 0.4 percentage points, while a fall in U.S. government expenditure of 1 per cent of GDP could reduce U.S. real interest rates by 1.1 percentage points.

The effect of changes in government expenditure on real interest rates is even higher in the OECD's INTERLINK model: real interest rates in industrialized countries are reduced by an average of 1.0 percentage points by the fifth year following a cut in government spending of 1 per cent of GDP. The INTERMOD simulations show a generally smaller effect of fiscal policy on real interest rates than either INTERLINK or most of the national models. The average effect on real interest rates of independent cuts in expenditure by G7 governments was only 0.2 percentage points in the INTERMOD simulations, suggesting that the results from the more elaborate simulations reported in Section 3 may in fact be somewhat conservative estimates of the contribution of fiscal policy to real interest rate movements over the past decade.

The Brookings Institution has compiled additional evidence on the significance of fiscal policy changes for real interest rates as part of its review of the simulation properties of eight internationally-linked macroeconomic models. As shown in Table 4, these

---

12. Richard Herd, 'The Impact of Increased Government Saving on the Economy,' OECD Department of Economics and Statistics Working Paper No. 68, (Paris: Organization for Economic Cooperation and Development, June, 1989).

TABLE 3

Impact on Real Interest Rates of a Reduction in Government Expenditure Equal to 1 Per Cent of GDP (GNP: Comparison of Model Results Five Years Following Beginning of Shock
(percentage points)

Country	National Model	Model Results		
		National Model	Interlink	Intermod
Canada	RDXF	-0.4	-1.4	-0.2
United States	FRB MCM Model	-1.1	-0.9	-0.5
Japan	EPA World Model	0.4	-1.2	-0.4
Germany	---	---	-0.4	-0.1
United Kingdom	H.M. Treasury	-2.4	-1.3	-0.1
France	INSEE Metric	0	-1.5	-0.2
Italy	---	---	0	0
Unweighted Average:		-0.9	-1.0	-0.2

* INTERMOD results are based on the assumption that agents are myopic. Unlike simulations reported earlier, shocks to government expenditure are performed separately for each country under consideration.

Source: Richard Herd, "The Impact of Increased Government Savings on the Economy, OECD Department of Economics and Statistics Working Paper No. G8, (Paris: Organization for Economic Cooperation and Development June 1989) Table 3, p.15.

TABLE 4

Response of U.S. Real Interest Rate to a Permanent Cut in U.S. Government Expenditure Equal to 1 Per Cent of GDP: Additional Model Results
(percentage points)

Model Name	Year of Simulation					
	1	2	3	4	5	6
Data Resources Inc. International Model	0.6	1.2	1.4	1.6	2.0	2.2
EEC Compact Model	0.6	1.0	1.1	1.3	1.7	1.8
Japanese Economic Planning Agency World Econometric Model	1.1	1.6	2.4	3.1	3.9	4.9
University of Pennsylvania Project LINK World Model	0	-0.1	-0.1	0	0.2	0.4
Federal Reserve Board Multicountry Model	1.0	1.3	1.5	1.6	1.9	2.1
OECD Interlink Model	0.9	1.2	1.1	1.4	1.2	1.8
Sims and Litterman World Vector Autoregression Model	0.4	0.8	0.1	0.1	0.1	0.1
Wharton Econometric Forecasting World Model	1.3	0.7	1.1	1.5	1.8	2.0
Average:	0.7	1.0	1.1	1.3	1.6	1.9

simulation results indicate that although the effect is initially small, a permanent cut in U.S. government expenditure equal to 1 per cent of GNP could reduce U.S. real interest rates by between 0.1 and 4.9 percentage points within six years. The drop in real interest rates averages 0.7 percentage points in the first year of the simulation, but rises to 1.9 percentage points after six years. It is interesting to note that more than 50 per cent of the average long-run fall in the real interest rate occurs within two years of the cut in government expenditure.

Finally, a review conducted by the U.S. Congressional Budget Office of more than 20 single-equation econometric studies of the relationship between U.S. government budget deficits and interest rates also contains evidence that expansionary fiscal policy raises real interest rates. Adopting widely differing theoretical perspectives and using a variety of statistical techniques, these studies found that a $50-billion reduction (equal to approximately 1 per cent of GDP) in the U.S. federal government budget deficit is associated with a rise in interest rates of between 0.2 and 1.5 percentage points.

6. Conclusions

Our comparison of real interest rates with movements in government expenditure, budget deficits, and public debt has shown how the exceptionally high real interest rates of the 1980s have been accompanied by a sustained increase in fiscal stimulus. Economic theory provides strong support for the view that increases in government expenditure contribute to higher real interest rates. Considerable controversy exists, however, regarding whether the effect on real interest rates from a deficit-financed increase in government expenditure exceeds that of a tax-financed expenditure increase (or, alternatively, whether agents perceive government bonds as net wealth). Orthodox Keynesian theory posits that the rise in public debt resulting from a deficit-financed government expenditure increase has an additional effect on real interest rates by raising household wealth. The life-cycle hypothesis, however, postulates that if forward-looking agents take account of the higher lifetime tax liabilities associated with public debt accumulation, then increases in public debt will have a smaller separate impact on real interest rates because the additional effect from increased holdings of government bonds on agents' financial wealth will be partially or fully offset by higher future taxes over their remaining lifetimes. Indeed, if agents' planning horizons are infinite due to the existence of intergenerational linkages, and they make

bequests to supplement the consumption of their offspring, then the rise in public debt stemming from government budget deficits will have no separate effect on real interest rates: regardless of the timing of future taxes, the rise in government expenditure will be accompanied by an equal reduction in private consumption.

Simulations using INTERMOD indicate that changes in fiscal policy can account for between 2.2 and 2.8 percentage points of the 5 percentage point increase in real interest rates between the 1970s and the early 1980s. The greatest effect on real interest rates can be traced to the increase in government budget deficits in the 1980s, with the rise in government expenditure also having a substantial additional effect. The rise in the stock of public debt, however, has little separate impact on real interest rates in the simulations, mainly because holdings of government bonds are a small component of total household wealth. These results hold for both temporary and permanent shocks when agents are forward-looking and therefore take into account some of the future tax liabilities from current budget deficits. The results are broadly supported by a number of other macroeconomic models and econometric studies.

References

Barro, Robert J. (1974) "Are Government Bonds Net Wealth?" The Journal of Political Economy, Vol. 82, No. 6, pp.1095-1117.

Blanchard, Olivier. (1985) "Debts, Deficits, and Finite Horizons," The Journal of Political Economy, Vol. 93, No. 2, pp. 223-47.

Brookings Institution. (1988) Empirical Macroeconomics for Interdependent Economies Vol. I and II. Ralph C. Bryant, Dale W. Henderson, Gerald Holtham, Peter Hooper, and Steven Symansky eds. (Washington, D.C.: Congressional Budget Office).

Congressional Budget Office. (1987) The Economic and Budget Outlook: Fiscal Years 1988-1992. (Washington, D.C.: Congressional Budget Office).

Herd, Richard. (1989) "The Impact of Increased Government Saving on the Economy," OECD Department of Economics and Statistics Working Paper No. 68, "Paris: Organization for Economic Cooperation and Development, June).

International Monetary Fund. (various issues) International Financial Statistics. (Washington, D.C.: International Monetary Fund).

Jenkins, Paul. (1991) "Real Interest Rates in Historical Perspective," Department of Finance Working Paper No. 90-6. (Ottawa: Department of Finance).

Meredith, Guy. (1989) "Intermod 2.0: Model Specification and Simulation Properties," Department of Finance Working Paper No. 89-7, (Ottawa: Department of Finance).

Modiglianni, Franco and Richard Brumberg. (1954) "Utility Analysis and the Consumption Function," in Kenneth K. Kurihara eds. Post-Keynesian Economics, (New Brunswick, New Jersey: Rutgers University Press).

OECD Department of Economics and Statistics. (1988) National Accounts: 1974-86. (Paris: Organization for Economic Cooperation and Development).